TRANSACTIONS

OF

THE ASIATIC SOCIETY

OF JAPAN.

VOL. IV.

From 20th October, 1875,

TO

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ASIATIC SOCIETY OF JAPAN.

The fourth annual meeting of the Asiatic Society of Japan was held in the Society's room at the Imperial University in Tôkiô, on Wednesday, the 14th July. The members present were: The Revd. Dr S. R. Brown, Sir Harry S. Parkes, Professors Syle, Veeder, Grigsby, Summers, Ayrton and Perry, Mr. De Boinville and Mr. C. H. Dallas.

The Chair was occupied by the Revd. D. Brown, the President.

The minutes of the last general meeting were read and confirmed.

The substance of the Council's Annual Report and a statement of the financial condition of the Society were given by the President.

The latter was shewn to be comparatively flourishing, there being a balance at the close of the half-year, ending June 30th, of $207.75 in the Treasurer's hand.

Sir Harry Parkes moved that the Report and Treasurer's account be received as read, which was seconded by Mr. Dallas and carried.

The President announced that the proposal made at the last general meeting to amend the Rules of the Society, relative to the number of its officers, had been considered by the Council and the committee of ordinary members appointed for the purpose, and that they had agreed to submit the following recommendation to the present meeting.

"That Rule 10 be amended by substituting the words 'ten Councillors' for 'five Councillors' and 'two Recording Secretaries' for 'one Recording Secretary'."

Moved by Mr. Dallas and seconded by Dr. Veeder that this recommendation be adopted, and the Rule be amended accordingly. Resolution carried.

The election of the Council and officers for the ensuing year was then proceeded with, and the following gentlemen were found to be elected.

President.—Sir Harry S. Parkes, K.C.B.

Vice-Presidents.—Revd. Professor Syle, H. E. Mon. C. de Groote.

Councillors.—Resident in Yokohama ; Dr. J. C. Hepburn, Revd. Dr. S. R. Brown, Messrs. Russell Robertson,* W. G. Howell, A. J. Wilkin.* Resident in Tôkiô ; H. E. M. de Struvé, The Hon. Arinori Mori, Rev. Dr. Veeder, Mr. W. G. Aston, Rev. Geo. Cochran.

Recording Secretaries: for Yokohama, Mr. C. H. Dallas.—For Tôkiô, Rev. Prof. Summers.

Corresponding Secretary: Prof. W. E. Ayrton.

Treasurer: Mr. John Walter.

Prof. Syle moved—" That the Council be requested to " consider the possibility of constituting an Historical " Section among the members of the Society." Dr. S. R. Brown seconded the motion, which was carried.

Prof. Syle then moved that the Council be also requested to consider the desirableness of establishing Branches of the Society at Kobe and Nagasaki. Prof. Summers seconded the motion, which was carried.

After a few further remarks upon the hours of meeting in Yokohama and Tôkiô, and the difficulty experienced by members from either place attending the meetings at the other place, the session was brought to a close by a few appropriate complimentary remarks by Sir Harry Parkes to the President retiring, and by a cordial vote of thanks for the services he had rendered to the Society during the two years of his Presidency.

Dr. Brown, in reply, regretted that failing health from time to time had prevented his doing so much for the society as he had desired.

* Since resigned and succeeded by Messrs. J. J. Keswick, and G. P. Ness.

REPORT OF THE COUNCIL OF THE ASIATIC SOCIETY OF JAPAN FOR THE YEAR ENDING JULY 1876.

The Council has much pleasure in reporting the continued success of the Society, and the progress that has been made during the last year. They congratulate the Society on having had the use of a convenient room granted to them by the Director of the Imperial University. In this room the whole of the Society's property has been deposited. The Library and Museum are now open daily from two to five o'clock for the use of the members and their friends. The following donations have been made during the course of the past year:—

Enumeratio Plantarum, Vol. 1 Part 2, presented by the Author, Dr. Savatier.

An Ancient Bell, presented by the Kenrei of Hiogo, through Sir Harry Parkes.

Numerous Specimens of Clothing, Shoes, &c., worn by the Peasants of the Yonezawa District, presented by C. H. Dallas, Esq.

A Collection of Japanese Butterflies, presented by H. Pryer, Esq.

Charts for Object Lessons introduced into Japanese Schools, presented by A. Hamao, Esq.

In Exchange for the Society's Journal the following Journals, Transactions, &c., have been received from England, France, Germany, Italy, India, China, and the United States.

The Royal Asiatic Society.—Proceedings.

The Royal Society.—Proceedings.

The Royal Geographical Society.—Proceedings.

The Philological Society.—Extra volumes and Transactions.

The Anthropological Institute of Great Britain and Ireland.—Journal.

The Microscopical Journal.

La Société de la Geographie.—Bulletin.

La Société d'Acclimatation.—Bulletin mensuel.
Le Congres d'Orientalistes.—Notices.
La Société des Etudes Japonaises.—Annuaire.
Monatsschrift für den Orient, Wien.
Mittheilungen der Deutschen Gesellschaft.—Yokohama.
Cosmos: from Guido Cora.
The Royal Asiatic Society, Bombay Branch.—Proceedings.
The Royal Asiatic Society, Ceylon Branch.—Proceedings.
The Asiatic Society of Bengal.—Proceedings & Journal.
The Royal Asiatic Society, North China Branch.—Proceedings.
The China Review.
The American Oriental Society.—Proceedings.
The Boston Society of Natural History.—Proceedings.
The American Philological Society.—Proceedings.

THE FOLLOWING BOOKS HAVE BEEN PURCHASED.

Travels of Marco Polo, edited by Col. Yule.
Macfarlane's Japan, 1 vol.
Timkowski's Travels, 2 vols.
Basil Hall's Loochoo, 1 vol.
Barrow's Travels, 1 vol.
Ritter's Erdkunde von Asien, 13 vols.
Shaw's Tartary, Yarkand and Kashgar, 1 vol.
Life and Letters of Lord Elgin, 1 vol.
De Carne's Travels in Indo-China.
Life of Buddha Gautama (Bigaudet), 1 vol.
Manual of Buddhism (Spence Hardy) 1 vol.
Abel's China, 1 vol.
Buddhagosha's Parables (Max Müller), 1 vol.
Cortambert's La Cochin-Chine, 1 vol.
Histoire de la Religion Chrétienne au Japon, 2 vols.
Semedo's History of China, 1 vol.
Tavernier's Travels in the East, 1 vol.
D'Herbelot's Bibliothèque Orientale, 4 vols.
Rémusat's Recherches sur les Langues Tartares, 1 vol.

Ide's (Ysbrant's) Travels from Moskow to Peking, 1 vol.
Memoirs of Sir G. Staunton, 1856, 1 vol.
Bunsen's Philosophy of Universal History, 2 vols.
Elphinstone's History of India, 2 vols.
Titsingh's Illustrations of Japan, 1 vol.
Pfizmaier on the Aino Language, 1 vol.

The General Meetings, as well as the Council Meetings, have been held during the past twelve months alternately at Yokohama and Tôkiô, an arrangement which, although attended with some inconvenience, is considered the best at the present time for the general interests of the Society.

The number of new Members elected has been 15, making a total number of 174 Ordinary Members, and 9 Honorary Members.

During the Session eleven papers have been read, viz.:

I.—On Some Copper Bells, by Kanda Takahira, The Governor of Hiogo *Ken*.

II.—Useful Minerals and Metallurgy of the Japanese, by Dr. Geerts.

III.—On Some Japanese Woods, by J. A. Lindo, Esq.

IV.—On the Winds and Currents of Japan, by Captain Scott.

V.—On the Temperature of the Japanese Waters, by J. H. Dupen, H.B.M. *Riugdove*.

VI.—Notes taken during a Visit to Okinawa—Loochoo Islands, by R. H. Brunton, Esq.

VII.—On the Arrow Poison in use among the Ainos of Japan, by Stuart Eldridge, Esq., M.D.

VIII.—Useful Minerals and Metallurgy of the Japanese by Dr. Geerts.

IX.—The Bonin Islands, by Russell Robertson, Esq.

X.—On Cotton in Japan, by T. P. Poate, Esq.

XI.—Notes of a Trip from Yedo to Kiôto, *viâ* Asamayama, the Hokurokudo, and Lake Biwa, by Professor D. H. Marshall.

Two Lectures have been delivered under the Society's auspices:—

On Indigo, by Professor Atkinson, at the Hall of the Horaisha.

On the Musical Notation of the Chinese, and its counterpart in Japan, by Professor Syle, at the University.

The following is the Treasurer's Report.

1st July to 31st December, 1875.

Dr.

To Balance in hand 1st July	317.32
,, Subscriptions collected from 7 members at $5 each	35.00
,, Sale of "Transactions"	41.00
,, Balance	106.55
	$499.87

Cr.

By Fire Insurance	10.00
,, Printing, Stationery, Advertising, Postage...	318.02
,, Rent at No. 28, 6 months at $20 per month...	120.00
,, Librarian's wages	35.85
,, Sundries	16.00
	$499.87

1st January to 30th June, 1876.

Dr.

To Subscriptions collected from 120 members at $5 each	510.00
,, Sale of 4 copies of "Transactions"	4.00
,, Received from Mr. Ayrton	9.59
	$523.59

Cr.

By Cheque to Mr. Thurburn, for Balance due Treasurer December 31, 1875	106.55
,, Printing, Stationery, Advertising, and Postage	71.50
,, Librarian's wages	29.00
,, Rent for January	20.00
,, Moving Library and Museum to Tôkiô ...	13.25
,, Purchase of a chair and tables	13.00
,, Payment for mounting maps	4.00
,, Purchase of a copy of "Marco Polo" ...	15.00
,, Payment to Captain Scott	10.00
,, Expenses at Horaisha in connection with Prof. Atkinson's lecture	8.50
,, Sundries	1.21
,, Purchase of a bookcase	23.83
,, Balance	207.75
	$523.59

To Balance deposited in the Hongkong and Shanghai Bank $207.75

JOHN WALTER,
Hon. Treasurer.

PRELIMINARY CATALOGUE

OF THE

JAPANESE KINDS OF WOOD,

WITH THE NAMES OF THE TIMBER TREES FROM WHICH THEY ARE OBTAINED.

By Dr. GEERTS, of Kioto.

——:o:——

The following Index intends only to give the exact Japanese, Sinico-Japanese, and botanical names of the trees, from which the Japanese take their different woods. Till yet the Japanese woods are imperfectly known. *Thunberg* gives some few notices in his "Flora Japonica." Lipsiae 1784; *Miquel* mentions in the "II vol. of Siebold's Flora Japonica" the use of several coniferous woods; *Veitch* gives in the "II vol. of *Alcock's* three years in Japan" pag. 480 a list of 36 kinds of woods, of which 15 species, however, remained undetermined. The other communications in different books about Japan are not worthy to be mentioned because the writers had no knowledge of the subject alluded to by them.

I therefore believe it a matter of some practical interest to draw up a list of all the woods, which have come under my knowledge. It is possible that a few kinds from the north of Japan are not mentioned, because I made my in-

vestigations chiefly in the south and the middle of this empire. I trust, however, that the number of these "omissions" will be proved to be very small.

This preliminary catalogue will afterwards be followed by a description of the woods. The list may, perhaps, be a useful guide for others, who like to collect and examine the Japanese woods.

Many of the kinds of wood mentioned in this list are used very seldom. Besides there are still many trees in Japan, which are not used at all as timber trees. These are therefore not mentioned in this catalogue. The classical Japanese botanical work of *Ono Ranzan* called "*Hon-zo-ko-moku-kei-mo*" has been perused for the exact Japanese names and synonyms, whilst the botanical names are accepted after *Miquel's* "Prolusio florae Japonicæ," Amsterdam, 1867.

Fam. Palmae.

1. Livistona Chinensis, R. Brn.... ... ... use: in joinery.	*Birô*; Hôki.	蒲葵ビロウ
2. *Areca Catechu, Linn. ... ... use; in joinery.	Binro-boku.	檳榔木ビンロウ
3. Chamaerops excelsa, Thunb. ... ... use: in joinery.	Shuro-no-ki; Shirogi; *So-riyo-boku.*	櫚櫚木シユロ

Fam. Coniferae.

4. Pinus massoniana, Lamb ... ... use: timber.	Kuro-matsu. *Kokusho.*	黒松クロマツ
5. Pinus densiflora, Sieb. Zucc.... ... ... use: timber.	Aka-matsu. *Sekisho.*	赤松アカマツ
6. Pinus parviflora, Sieb. Zucc.... ... ... use: timber.	Go-yo-no-matsu. *Goyosho.*	五葉松ゴヤウノマツ
7. Pinus Koraiensis, Sieb. Zucc. ... ... use: timber, boxes.	Chosen-matsu. Umi-matsu.	朝鮮松テウセンマツ
8. Larix Leptolepis, Gord. ... ... (used in Yeso.)	Fuji-matsu. *Rakuyosho.* (falsely also Kara-matsu.)	落葉松フジマツ

*Those marked † are not Japanese.

9. Abies Firma, SIEB. ZUCC. ... ... use : timber, boxes.	*Tômomi* ; Karasho ; (Ho-bi-sho.)	唐樅トウモミ
10. Abies Jesoënsis, SIEB. ZUCC. ... ... (used in Yeso.)	Yeso-matsu.	エゾマツ
11. Abies polita, SIEB. ZUCC. ... ... use : timber, boxes.	Tora-momi. (Ho-bi-sho.)	トラモミ
12. Abies Tsuga, SIEB. ZUCC. ... ... use : timber (valued.)	Toga-matsu ; *Tsūga*. (Falsely also Araragi.)	トガマツ栂
13. Taxus cuspidata, S. Z. ... ... (used in Yeso)	Araragi. *Suisho*. (falsely also Momi.)	水松アララギ
14. Thujopsis dolabrata, S. Z. ... ... use : timber (much valued)	Hiba ; Asunaro. *Rakan-haku* ; Nedzu.	羅漢柏ヒバ杜松
15. Chamaecyparis obtusa, ENDL. ... ... use : timber (much valued)	Hinoki. *Hen-baku*.	扁柏ヒノキ檜
16. Chamaecyparis pisifera, ENDL. ... ... use : timber and coopers' work (much valued).	Sawara. *Kuwa-haku*.	花柏サハラ弱檜
17. Cryptomeria japonica, DON. ... ... use : timber, coopers' work.	Sugi ; *San*.	杉スギ
18. Podocarpus macrophylla, DON. ... ... use : timber, boxes.	Maki. *Rakansho*.	羅漢松マキ槙

19. Salisburia adianthifolia. SMITH. ... ... use: boxes, chessboards.	Icho; Ginan. *Ko-son-ju.*	公孫樹 イチヤウ 銀杏	
20. Cephalotaxus drupacea, S. Z. use: timber, boxes.	Inu Kaya. *Sōhi,* Bebe-kaya.	粗榧 イヌガヤ	
21. Cephalotaxus pedunculata, S. Z. ... ... use: timber, boxes.			
22. Torreya nucifera, S. Z. ... ... use: boxes, fine timber.	Kaya. *Hi.*	榧 カヤ	

Fam. Styraceae.

23. Styrax japonicum, S. Z. ... ... use; joinery.	Chisha-no-ki. (Seiton-kuwa, *Kin-ren-shi.*	金連子 チシヤノキ	5
24. Styrax Obassia, S. Z. ... ... use: joinery.	O-ba-no-chisha. (*Bakunboku.*)	大葉ノチシヤ 白雲木	
25. Symplocos lancifolia, S. Z. ... ... use: Joinery.	Inoko-shiba. (Iso-gama-haï-no-ki.)	イノコシバ	
26. Symplocos japonica, S. Z. 26. Symplocos lucida, S. Z. ... ... use: joinery.	Kurogi.	クロギ	
27. Symplocos prunifolia, S. Z. ... ... use: joinery.	Haï-no-ki. *San-pan.* (Some-shiba.)	ハイノキ 山樊	
28. Symplocos myrtacea, S. Z. ... ... use: joinely.	Inoko-shiba. (Miyama-nigaki.)	イノコシバ	

Fam. Ebenaceae

29. †Diospyros Ebena, Linn. ... ... Koku-tan; *Uboku.* 烏木コクタン
use: joinery, boxes.

30. Diospyros kaki, Linn. Fil. ... ... Kuro-gaki; *Koku-shi.* 黒柿クロガキ
use: joinery, boxes. Shima-gaki.

Fam. Salicineae.

31. Salix japonica, Thunb. ... ... Shidare-yanagi *Riu.* 柳シダレヤナギ

32. Salix gracilistyla, Miq. ... ... Kawa-yanagi. 水楊カワヤナギ
use: boxes. *Sui-yo.* 檉

32. Salix Burgeriana, Miq. ... ...
use: boxes.

Fam. Betulaceae.

33. Betula alba, Linn. Var. ... ... Shira-kaba, *Haku-kuwa.* 白樺シラカバ
Japonica, Miq. ... ... Kuwa-boku.
use; writing boxes, &c.

34. Betula lenta, Willd. ... ... Kawara-buna. カワラブナ
use: boxes.

35. Alnus firma, Sieb. Zucc. ... ... Yama-harino-ki, ヤマハリノキ赤楊
use: boxes, &c. (Hari-yanagi)
Seki-yo

35*bis*. Alnus maritima NUTT. ... ... Hari-no-ki. ハリノキ

Fam. Cupuliferae.

36. Quercus cuspidata, THUNB.... ... ... Shii-no-ki; *Ka-ju*. 柯樹シイノキ椎
use: handles, ships, timber.

37. Quercus Sieboldii, BLUME. ... ... Shiro-gashi. *Haku-ken*. シロガシ鉤栗白櫧
use: the same. Ko-ritsu.

38. Quercus acuta, THUNB. ... ... Aka-gashi. *Seki-ken*. アカガシ赤櫧
use: the same.

39. Quercus glauca, THB. ... ... Ara-gashi. *So-ken*. アラガシ粗櫧
use: the same. (Kuso-gashi,)

40. Quercus crispula, BLUME. ... ... Nara. *Yu*. ナラノキ楢
use: the same.

40*bis*. Quercus dentata, THUNB.... ... ... Kashiwa. *To*. 槲カシハ

41. Quercus serrata, THUNB. ... ... Kunugi. カヌギササガシ
use: the same. (Sasa-gashi.)

42. Castanea crenata, S. Z. ... ... Kuri-no-ki. 栗木クリノキ
use: boxes, joinery, furniture. *Ritsu-boku*.

43. Fagus sieboldii ENDL. ... ... Buna-no-ki. *Mō*. ブナノキ橅
use: handles, joinery, agricultural instruments.

44. Corylus heterophylla, FISCH. ... ... Hazibami. 榛ハシバミ
use: joinery. *Shin*.

Fam. Myriceae.

45. Myrica Nagi, Cas. ... ... Yama-momo. *Yobai.* 楊梅ヤマモモ
use: on the turning bench for small household things.

Fam. Artocarpeae.

46. Morus alba, Linn. ... ... Kuwa-no-ki. *So-boku.* 桑木クワノキ
use: joinery, furniture.

47. Morus indica, Linn. ... ... Kara-kuwa. 縣カラクワ
use: the same.

48. Ficus pyrifolia, Burm. ... ... Inu-biwa; Mamegi; *Ten-sen-kuwa.* Bun-ko-kuwa. 天仙花イヌビワ
use: the same.

Fam. Ulmaceae.

49. Planera japonica, Miq. ... ... Keyaki. *Yo.* 欅ケヤキ
use: timber, joinery, furniture, &c.

50. Microptelea parviflora, Spach. ... ... Niré; ya-niré; *Yu.* 楡ニレ
use: timber, joinery.

50*bis*. Ulmus campestris Sm. ... ... Kobu-niré; Yagiri. コブニレ

Fam. Celtideae.

51. Homoioceltis aspera, Bl. ... ... use: timber. The leaves for polishing.	Muku. *Zo-yo-ju.*	糙葉樹 ムクノキ 椋
52. Celtis sinensis, Pers. ... ... use: timber, joinery.	Yenoki; *Boku-ju.*	朴樹 エノキ 櫪

Fam. Euphorbiaceae.

53. Excoecaria japonica, J. Mull. ... ... use: joinery.	Ha-ra-toku; Siraki; *U-kiu-boku species.*	烏臼木 ノ一種 シラギ コクボノクワシ
54. Sapium Sebiferum, Roxb. ... ... use: the same.	Tō-haze; (Nankin hazè.) U-kiu-boku *To-ro.*	唐櫨 トウハゼ
55. Elaeococca cordata, Bl. ... ... use: the same.	Abura-giri; *O-shi-do.*	罌子桐 アブラギリ 雀桐
56. Buxus japonica, J. Mull. ... ... use: combs, strong handles, &c., (boxwood)	Inu-tsugé. *Saku-boku;* Tsugé.	イヌツゲ 柞木 黄楊

Fam. Thymeleae.

57. Daphne odora, Thunb. ... ... use: joinery.	Jin-chō; *Dzuï-ko.* Jin-chō-ké.	瑞香 ジンチャウ 沈丁花

58. Cinnamomum japonicum, NEES. ... ... use : timber, furniture.	Yabu-nikkeï. *Ten-tsiku-keï.*	天竺桂ヤブニッケイ
59. Cinnamomum pedunculatum, NEES. ... use : furniture, joinery, timber.	Tabu ; kuro-tsudzu. *Ten-tsiku-keï. species.*	天竺桂一種タブノキ
60*bis*. Machilus Thunbergii SIEB. ZUCC. ...	*Nan ;* Inu-kusu.	楠ナン
60. Cinnamomum, Camphora, NEES. ... ... use : timber, furniture.	Kusu. *Sho.*	樟クスノキ
61. Litsaea glauca, SIEB. ... ... use : joinery, furniture.	Shiro-tsudzu. (Shiro-damo.) *Ten-tsiku-kei species.*	天竺桂一種シロダモ
62. Lindera umbellata, THUNB.... ... ... use : timber.	Inu-kusu : *Ku-shō species ;*	イヌクス釣樟一種
63. Lindera triloba, BL. ... ... 63. Lindera obtusifolia, BL. ... use : toothpicks, eating sticks, &c., ...	Shiro-modzi ; Hata-ukon ; ukon-bana. *U-yaku species.*	シロモジ烏菜一種
64. Lindera Sericea, BLUME. ... ... use : eating sticks, toothpicks.	Kuro-modzi ; Tori-shiba ; *Kushō.*	クロモジ釣樟
65. Actinodaphne lancifolia, MEISSN ... ... use : joinery.	Koga-no-ki : Kago-kashi ; (*Riku-haku.*)	コガノキ六駁

66. Tetranthera japonica, S. ... ... Hama-biwa; *Keï-jou.* ハマビワ
use: the same.

Fam. Santalaceae.

67. †Santalum album, LINN. ... ... *Biyaku-dan.* 白檀ビヤクダン
use; joinery.
68. †Santalum myrtifolium, SPR. ... ... *Ō-dan* 黄檀ヲヲダン
use; the same.

Fam. Oleaceae.

69. Ligustrum japonicum, THB. ... ... Tani-watashï. Nedzu-mi-mochi. *Jō-tei.* (falsely also Ibota.) タニワタシ女貞
use: joinery, boxes, religious instruments.
70. Ligustrum Ibota, SIEB. ... ... Ibota; *Suï-ro-ju.* 水蠟樹イボタノキ
use: the same.
71. Fraxinus longicuspis, S. Z. ... ... *Shin*; Aö-Toneriko. 榛トヂリコ
use: joinery, boxes.
72. Fraxinus Sieboldii, BLUME. ... ... Toneriko; Tamu-no-ki; *Shin* タムノキ榛
use: the same.
73. Fraxinus excelsior, L. ... ... So-chō. ソウチヤウ
use: the same.
73*bis*. Olea aquifolium SIEB. ZUCC. ... ... *Ku-kotsu.* Hiragi. 枸骨ヒラギ柊

Fam. Scrophularineae.

74. Pauwlonia imperialis, S. Z.... ,... ... Kiri: Tō. 桐キリ
use: boxes, furniture, shoes.

Fam. Magnoliaceae.

75. Magnolia hypoleuca, S. Z. ... ... Hō-no-ki; *Sho-shu-Kō-boku*, Tan-baku, Furanda-boku. 商州厚朴ホウノキ淡白
use: sword-sheets, boxes.

76. Cercidiphyllum japonicum, ... Katsura. *Keï.* 桂カツラノキ
S.Z.
use: furniture, boxes.

Fam. Rutaceae.

77. Zanthoxylon Schinifolium, ... Inu-san-sho; *Gai-shiku.* イヌザンショ崖椒犬山椒
S. Z.
use: joinery.

77*bis*. Evodia glauca, Miq. ... ... Ki-wada; *O-baku.* 黄蘗キハダ

Fam. Meliaceae.

78. Melia japonica, Don. ... ... Sendan. Ren. *Sen-na-ren.* 栴那楝センナ苦楝
use: timber, furniture, boxes.

Fam. Tiliaceae.

79.	Tilia cordata, MILL ... ... use: joinery, religious instruments.	*Bodaiju*, (Shinanoki.)	菩提樹シナノキ

Fam. Sterculiaceae.

80.	Firmiana platanifolia, R. BRN. ... ... use: wooden shoes, timber, &c.	Aŏ-giri; *Go-tō.*	梧桐アヲギリ

Fam. Ternstroemiaceae.

81.	Ternstroemia japonica, THB. ... ... use: joinery.	Sui-moku-Seï; Moku-koku; *Seki-kuwa species.*	石瓜一種モツコク
82.	Cleyera japonica, THB. ... ... use: same and religious instruments.	Sakaki: *Yōtō.*	榊サカキ楊桐
83.	Camellia japonica, LINN. ... ... use: joinery, turning benches.	Tsubaki; *Shin.*	椿ツバキ
84.	Camellia Sasanqua, SIEB. ... ... use: the same.	Sasankuwa; *Chabai.*	茶梅サザンクワ

Fam. Acerineae.

85. Acer palmatum THB. ... ... Momiji; *Hō-ju.* 楓樹モミヂ紅葉
et aliae diff. species.
use: household implements.

Fam. Sapindaceae.

86. Sapindus Mukorosi, GÆRTN. ... ... Mukurosi; *Mu-kuwan-shi.* 無患子ムクロヂ
use: joinery.
87. Aesculus turbinata, BLUME. ... ... Tochi-no-ki; *Shichiyo-ju.* 七葉樹トチノキ
use: joinery.

Fam. Araliaceae.

88. Aralia Canescens, S. Z. ... ... Dara-noki; *Soboku.* 楤木ダラノキ
use: ?

Fam. Hamamelideae.

89. Distylium racemosum, S. Z... ... ... Yusu; Hiyon-no-ki; *Bun-bo-ju.* 文蛟樹ヒヨンノキ 柚
use: fine furniture, joinery, turning bench, hydraulic works.

Fam. Corneae.

90. Aucuba japonica, THB. ... ... use : small boxes.	Aöki ; *Tō-yō-san-go.*	冬葉珊瑚アヲキ
91. Cornus officinalis, S. Z. ... ... use : small furniture.	*San-shu-yu* ; Seki-so.	山茱黄サンシユウ 石棗

Fam. Ilicineae.

92. Ilex rotunda, THB. ... ... use : turning benches.	Tori-mochi. *Nen-ri.*	粘鶏トリモチ
93. Ilex integra, THB. ... ... use : the same.	Mochi-no-ki ; *Tō-sei. spec.* Man-nen-ju.	冬青一種トリモチノキ
94. Ilex Bürgeri, MIQ. ... ... use : the same.	Torimochi ; Sakura-mochi.	サクラモチノキ
95. Ilex Oldhami, MIQ. ... ... use : the same.	Shiroji ; Namame : *Tō-sei* Fukura-kochi.	フクラコチ冬青
96. Ilex argutidens, MIQ. ... ... use : the same.	Uno-modoki.	ウノモドキ
97. Ilex pedunculosa, MIQ. ... ... use : the same.	Sakura-mochi.	サクラモチ
97*bis*. Ilex latifolia, THB.	*Ta-ra-yo.*	多羅葉

Fam. Celastrineae.

98. Euonymus Sieboldianus, BLUME. ... ... Mayumi; *Yeï-bo*; To-yo-yeï-bo. 衝矛マユミ
use: joinery.

99. Celastrus articulata, THB. ... ... Tsurū-mumé-modoki. ツルムメモドキ
use: the same.

Fam. Anacardiaceae.

100. Rhus sylvestris, S. Z. ... ... Yama-hasé; *San-rō*. 山櫨ヤマハゼ
use: boxes.

101. Rhus succedanea, LINN. ... ... Hasé; Ō-rō. *Rō*. 櫨ハゼ
use: the same.

Fam. Lythrarieae.

102. Lager stroëmia indica, LINN. ... ... Saru-suberi; Hiyaku-nichi-ko. *Biaku-ji-ko*. 百日紅サルスベリ
use: religious instruments, turning benches.

Fam. Rosaceae (Pomaceae).

103. Pyrus aucuparia, GAERTN. ... ... Yama-nashi; *Roku-ri*. 鹿梨ヤマナシ
use: turning benches for small things.

104. †Pyrus Sinensis, WILLD. ... ... Kuwarin. *Riyo-boku*. 櫚木クワリン
use: joinery and turning benches.

105. Amelanchier Canadensis, TORR. ... ... use: same.	Zai-buri; Sidé; Hō-i; Fu-shi. *Fū-i.*	扶桙ザイブリ
106. Eriobotrya japonica, LINDL. ... ... use: the same.	*Hiwa*; Biwa.	枇杷ビハ
107. Rhaphiolepis japonica, S.Z. ... ... use: the same.	Yama-moku-koku.	ヤマモツコク
108. Crataegus cuneata, S. Z. ... ... use: the same.	*San-zashi.*	山査子サンザシ
109. Crataegus alnifolia, S. Z. ... ... use: the same.	Shira-side; Hakari-no-mi.	シラシデ

Fam. Amygdaleae.

110. Prunus Mume, S. Z. ... ... use: small household instruments.	Mŭmé; *Bai.*	梅ムメ
111. Prunus Puddum, WALL. ... ... use: woodcuts, furniture, turning benches.	Sakura; San-ō-tō; *Ō.*	櫻サクラ
112. Prunus Armeniaca, LINN. ... ... use: turning benches.	Andzu; *Kiyo.*	杏アンズ
113. Amygdalus persica, LINN. ... ... ∴ use: turning benches.	Momo; *Tō.*	桃モモ
114. Prunus japonica, THB. ... ... use: turning benches.	Su-momo; *Ri.*	李スモモ

Fam. Leguminosae.

115. Sophora Japonica, L. ... ... Yen-ju ; *Kuwai-ju.* 槐樹エンジユ
use : joinery.

116. †Pterocarpus indicus, L. ... ... *Shitan.* 紫檀シタンノキ
use : furniture, joinery.

117. †Pterocarpus Santalinus, L. ... ... *Shi-tan.* 紫檀シタン
use : the same.

118. Wisteria Chinensis, S.Z. ... ... Fuji ; Shi-to ; *Tō.* 藤フジ
use : for binding in hydraulic works.

Fam. Sabiaceae.

119. Meliosma rigida, S. Z. ... ... Yama-biwa ; (Suga-no-ki) マヤビハ, スゲノキ
use : joinery.

Fam. Juglandeae.

120. Platycarya Strodilacea, S.Z. ... ... No-gurumi ; Yama-gurumi. *To-ro-ju.* 兜櫨樹ノウグルミ
use : joinery, furniture.

120*bis*. Yuglans Sieboldiana, MAX. ... ... To-kurumi. *To-ko-to.* kara-ko-to. 唐胡桃トウグルミ

Fam. Bignoniaceae.

121. Catalpa Kaempferi, S.Z. ... ... Rai-den-giri ; *Shiu.* ライデンギリ楸
use : the same.

CHINESE WOODS, used in Japan; the trees of which could not be determined; they are mostly heavy woods and only used in joinery and cabinet work.

122. 油脂木 .....*Chan-no-ki*.....
Yu-shi-boku.....Brown coloured wood, with coarse grain.

122. 黃木 .....*O-ki. O-boku*....Fine yellow wood.

124. マイ蔔萄 ....*Mai-budo*.....Nice brown and hard wood with numerous knots.

125. 唐桐 .....*Tō-giri*.....Greyish fine hard wood.

126. メイサク ...*Meï-saku*.....Heavy, purple-brown. wood.

127. 唐柚 .....*Tō-yusu*.....Very heavy, strong yel. low wood, with fine grain.

128. 紅木 .....*Ko-boku*.....Very heavy, dark violet wood, with very fine grain.

129. ヤム木 .....*Yamu*.....Light brown wood, ressembling *channoki*.

130. 赤ヤム .....*Aka-yamu*.....Fine, red, heavy wood with fine grain.

131. 降眞香 .....*Goshinko*.....Dark red heavy wood, silky lustre.

132. 鐵木 .....*Tetsu-to-boku*....Strong, heavy black wood.

133. タガヤサン *Tagayasan*
Tetsu-riyoku-boku.....Dark brown hard and heavy wood.

134. アカキ.....*Akaki*.....Heavy red wood which polishes extremely well.

Of some of the above mentioned woods there exist numerous varieties, especially of *Hinoki* (Chamaecyparis obtusa, ENDL.); *Sugi* (Cryptomeria Japonica, DON); *Kuwa* (Morusalba, L); *Keyaki* (Planera Japonica, MIQ.); *Tabu*

(Cinnamomum pedunculatum, NEES); *Kusu* (Cinnamomum Caphora, NEES); *Kiri* (Pauwlonia Imperialis, S. *Z.*) *Sendan* (Melia Japonica. DON); *Yusu* (Distylium racemosum, S. *Z.*); *Sakura* (Prunus Puddum, WALL); &c. The following have already come to our knowledge: —

VARIETIES OF *Hi-no-ki*—(Chamaecyparis obtusa, ENDL.)

Jo-hin-hi-no-ki.—Best kind of 1 quality.

Chiu-dori-hi-no-oi.—Middle quality.

Owari-masa-hi-no-ki.—Very fine, striped wood, much valued.

Masabi or *Masa-hi-no-ki.*—Striped variety.

Midare hi-no-ki.—With irregular fibres,

Masa-ita.—Thin plates for covering roofs of Temples (*Hiwadabuki.*)

VARIETIES OF *Suji.*—(Cryptomeria Japonica, DON.)

Yakushima Sugi or *Yaku-Sugi.*—Fine brown flame-coloured fibre (high value.)

Shiro-Yaku-Sugi.—Precious; white variety.

Tamino-Sugi.—Fine striped wood.

Masa-sugi.—Striped variety.

Ô-masa-Sugi.—With large elongated veins,

Jo-hin-Masa-Sugi.—Much valued kind, with very narrow fibres.

Miyako-Masa-Sugi.—The same, but the colour light.

Shibu-ita-Sugi.—Lower quality of a greyish colour.

Okino-Sugi.—Long fibre wood.

Ku-robe-Sugi.—Reddish-brown variety of middle quality.

Tani-Sugi.—The same, a little more dark.

Tosa-Sugi.—Reddish variety, much valued for coopers' works.

Oni-Sugi or *Udzura-moku.*—With dark coloured knots.

Kurobe-ita.—Thin plates of grey colour for covering roofs.

None-ita.—The same, but of reddish colour.

Sugi-Masa-ita.—The same, but with prominent rectilinear fibres.

VARIETIES OF *Kuwa.*—(Morus alba, LINN.)

Jo-hin-ma-kuwa.—Fine, silky wood of 1st qual.

Chiu-dori-kuwa.—Middle quality.

Shira-kuwa.—White variety.

Tō-kuwa.—Dark-coloured, much valued variety from China.

Mishima-kuwa.—Good, much valued quality.

VARIETIES OF *Keyaki.*—(Planera japonica, MIQ.)

Nebori-keyaki.—Root-wood with curved knots, much valued variety.

Tama-keyaki.—With fine curved knots, much valued.

Tama-shiro-keyaki.—The same, but with white colour.

Jo-hin-masa-keyaki.—First quality wood with narrow rectilinear fibres.

Chiu-dori-masa-keyaki.—Middle quality wood.

Shiro-keyaki.—Light coloured variety of ordinary wood.

Moku-keyaki.—The ordinary kind of *keyaki* wood.

VARIETIES of *Tabu.*—(Cinnamomun pedunculatum, NEES.)

Beni-tabu.—Red variety of this beautiful wood.

Shira-tabu.—White variety, less valued.

Hama-tabu.—Brown variety, with curved, irregular fibres.

Masa-tabu.—With rectilinear stripes.

Shima-tabu.—With very prominent rectilinear fibres.

Hana-tabu.—Fine variety with fine lustre.

Kara-tabu.—Dark-brown variety.

Tama-tabu.—The best and finest variety, with curved knots, and light yellow colour.

VARIETIES OF *Kusu.*—(Cinnamomum Camphora, NEES.)

Ma-kusu.—Light-brown variety of good quality.

Shirata-kusu.—Greyish variety of inferior quality.

Shima-kusu.—With rectilinear fibres and reddish colour.

Shira-kusu.—White variety of inferior value.

Aka-kusu.—Dark reddish-brown variety.

Kami-kusu.—Strong wood.

Hei-kusu.—Greyish, bad variety.

Hama-kusu.—Good quality.

Moku-kusu.—The same.

Ko-kusu.—With a very strong smell of camphor.

Masa-kusu.—Fine striped kind.

Kara-kusu.—Dark-coloured, hard variety.

Inu-kusu.—Less valued quality.

Aökusu.—Blueish variety of inferior quality.

Sato-kusu.—Soft quality, with much lustre.

VARIETIES OF *Kiri.*—(Pauwlonia imperialis S.Z.)

Jo-hin-kiri.—Best quality, with brilliant lustre.

Shima-kiri.—With dark coloured rectilinear stripes.

Sato-giri.—Very light wood.

Itame-kiri.—Nice wood with curved veins.

Yama-kiri.—Common wood of inferior quality.

Aö-giri.—The greyish-blue wood of FIRMIANA PLATANIFOLIA R. BRN., which tree is unjustly considered by the Japanese to be a kind of *kiri* (Pauwlonia).

VARIETIES OF *Sendan.*—(Melia Japonica, DON).

Tama-moku-Sendan.—Beautiful wood with dark knots on a yellow base.

Jo-hin-Sendan.—Best quality of straight wood.

Chiu-dori-Sendan.—Middle quality.

Kawa-Sendan.—Ordinary, common variety.

Masa-Sendan.—Good quality with prominent rectilinear veins.

VARIETIES OF *Yusu.*—(Distylium Racemosun, S.Z).

Hana-yusu.—Light purple-coloured, heavy wood.

Yusu.—Good ordinary wood for hydraulic works.

Inu-yusu.—Common blueish variety.

Aka-yusu.—Reddish variety.

To-yusu.—Dark, very hard and heavy wood.

VARIETIES OF *Sakura.*—(Prunus Puddum, WALL.)

Yama-Sakura.—Common reddish-brown wood, excellent for furniture.

Aka-sakura.—More reddish coloured variety.

Kikori-Sakura.—Used for wood-cuts.

KIOTO 12th June, 1875.

ALPHABETICAL LIST OF THE JAPANESE NAMES.

A.

B.

C.

D.

F.

G.

H.

I.

J.

K.

M.

N.

O.

R.

S.

T.

U.

Y.

Z.

EXPERIMENTS
UPON
THE STRENGTH OF JAPANESE WOODS.

BY

PROFESSOR R. H. SMITH.

Read before the Asiatic Society of Japan, on the 20th of October, 1875.

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The experiments upon timber, the results of which are exhibited in the accompanying table, were made by the Junior Class of Engineering, in the Kaisei Gakko, Tokio, in the months of May and June, 1875. They were made with the help of a very simple self-registering machine, built of wood. Three bars of each kind of wood were ordered about $1^m\ 200^{mm}$ long, and of a rectangular section of $50^{mm} \times 30^{mm}$. The bar was laid upon brass supports, both at the same level, and exactly 1^m distant from each other, and the load was gradually piled up on a tray which hung by a large hook from the middle of the bar. From this hook ran a thread over a pulley to the side of the machine, and the movement of this thread, which was kept tightly stretched by a weight, shewed the deflection produced by each load as it was applied. This deflection was recorded on a sheet of paper stretched on a board, by means of a pencil which was drawn upwards by the thread coming from the pulley, while at the same time the board on which the paper was fastened was drawn cross-wise by hand through a distance proportional to the weight on the tray. This weight was increased by 10 kilogrammes at a time, and, when the bar was about to give way, by 5, or 3, or sometimes only 1 kilogramme at a time. The "stepped" curve thus obtained is in every way quite as useful as a continuous curve, which might easily

be got by a more complicated arrangement. The strength at the breaking point was calculated from the formula:

$$\text{Strength} = \frac{3}{2} \frac{\text{Breaking Load} \times \text{Distance between supports.}}{\text{Sectional Breadth} \times \text{square of sectional Depth.}}$$

The strength at the limit of elasticity was calculated, of course, in exactly the same way, the corresponding load being in most cases easily obtained by inspecting the diagram on the paper. It is right to say, however, that in most cases the curve begins to bend upwards slightly very soon, and as this bending upwards continues to increase gradually, it is sometimes difficult to say which point ought to be taken as the limit of elasticity. The point fixed upon, therefore, depends to some extent upon individual judgment.

The modulus of elasticity was calculated from the equation:

$$\text{Modulus of Elasticity} = \frac{\text{100 klgrs.} \times \text{cube of distance between supports.}}{\text{Deflection produced by 100 klgrs.,} \times 4 \times \text{sectional breadth} \times \text{cube of sectional depth;}}$$

the diagram up to 100 kilos in every case approximating closely to a straight line. The actual deflection caused by a stress greater than that corresponding in these experiments to a load of 100 kilos would, therefore, be greater than would be calculated using the tabulated modulus of elasticity. It is also to be noticed that in many cases—in almost a majority of cases—the elasticity varies too much in the different experiments to make it properly allowable to take an average between them. The same may be said of the Specific Gravities. The very evident principal reason of this is the very bad seasoning of Japanese timber.

It is said that it is impossible to season Japanese timber properly, but, although it may be quite true that with ordinary means it cannot be so well seasoned as European and American timber, still there can be no doubt that by proper attention to the subject of both growing and seasoning, vastly better results could be obtained than are at present arrived at.

I think I may guarantee that all the measurements and calculations have been accurately made.

EXPERIMENTS ON JAPANESE TIMBER.

MADE BY THE JUNIOR CLASS OF ENGINEERING, KAISEI GAKKO, TOKIO.

DURING MAY AND JUNE, 1875.

Japanese Name.	English Name.	No. of Experiment.	Weight per Cubic Metre in Kilogrammes.	Average.	Dimensions of Bar.	Breking Weight.	Ultimate Deflection.	Load at Limit of Elasticity.	Deflection at Limit of Elasticity.	Calculated Breaking Strength.	Average.	Calculated Modulus of Elasticity.	Average.	Calculated strength at Limit of Elasticity.	Average.
杉 Sugi	Japan Cedar	1	401	409	1m × 50mm × 30mm	205	40.0	180	19.0	4.10	4.30	666.6	787.3	3.2	3.43
		2	413		,, × ,, × 29	218	26.0	180	17.5	4.51		862.1		3.7	
		3	413		,, × ,, × 30	215	25.0	170	15.5	4.30		833.3		3.4	
神代杉 Jindai-Sugi	Cryptomeria	1	439.2	428	,, × 47.5 × 30	210	17.5	130	8 o	4.65	4.31	1296.0	1058.6	2.87	3.37
		2	427.6		,, × ,, × ,,	200	18.0	170	15.5	4.54		972·0		3.77	
		3	418.7		,, × 48 × ,,	205	23.5	160	15.0	4.45		907.9		3.47	
一位ヌ欄 Ichii	Yew	1	479.2	498	,, × 49 × 30	305	50.0	200	20.0	6.35	6.44	944.4	876.5	4.15	4.74
		2	523.7		,, × 50 × ,,	285	41.0	240	24.0	5.70		740.7		4.80	
		3	492.8		,, × 49 × ,,	350	55.0	250	26.0	7.29		944.4		5.26	
檜 Hinoki	Spruce Fir	1	400.0	399	,, × 49 × 30	255	25.0	210	15.0	5.31	4.61	1089.7	1150.2	4.37	3.60
		2	392.1		,, × ,, × ,,	215	30.0	160	13.0	4.47		944.4		3.33	
		3	406.7		,, × ,, × ,,	195	30.0	150	12.0	4.06		1416.6		3.12	
椹 Sawara	Spruce Fir. (Deal)	1	324	333	,, × 47 × ,,	160	28.0	120	14.5	3.62	3.41	697.9	578.5	2.72	2.43
		2	342.6		,, × 49 × ,,	150	27.5	100	15.0	3.12		472.2		2.08	
		3	333.2		,, × ,, × ,,	168	31.5	120	15.0	3.92		565.3		2.49	
赤松 Aka-Matsu	Red Pine	1	560.7	623	,, × 48 × ,,	280	30.0	250	14.5	6.09	5.88	1674.5	1769.6	5.43	5.22
		2	666.2		,, × ,, × ,,	280	21.0	250	14.5	9.08		2152.9		5.43	
		3	642.4		,, × 50 × ,,	275	33.5	240	13.5	5.50		1481.5		4.80	
姫小松 Himeko-Matsu	Yellow Pine	1	569.7	576	,, × 48.5 × ,,	315	27.0	280	16.5	6.69	6.58	1460.9	1667.9	5.95	6.01
		2	599.0		,, × 50 × ,,	310	22.0	290	20.0	6.20		1904.8		5.80	
		3	561.0		,, × 48 × ,,	315	29.0	290	26.0	6.84		1638.1		6.29	

Japanese Name.	English Name.	No. of Expert.	Weight per Cubic Metre in Kilogrammes.	Average.	Ultimate Deflection.	Load at Limit of Elasticity.	Deflection at Limit of Elasticity.	Calculated Strength	Dimension of Bar.	Breaking Weight.	Breaking Strength.	Calculated Modulus of Elasticity.	Average.	Calculated strength at Limit of Elasticity.	Average.
松 Matsu	Common Pine	1	544.1	573	29.3	220	16.0	6.24	,, × 49 × ,,	300	Average. 6.09	1416.7	1673.1	4.58	4.70
		2	616 9		31.5	240	14.5	6.24	,, × ,, × ,,	300		1770.8		4.99	
		3	559		32.5	220	14.5	5.81	,, × ., × 29	270		1831.8		4.53	
榧 Kaya	Nut-bearing tree resembling Yew	1	464.9	479	42.0	250	21.0	6.77	,, × 49 × 30	325	6.54	885.4	1267.7	5.21	5.16
		2	477.2		37.5	270	19.0	6.42	,, × 49.5 × ,,	315		1526.8		5.50	
		3	477.2		30.0	230	16·0	6.45	,, × 49.3 × ,,	310		1390.9		4.79	
樅 Momi	Fir. (Coarse Texture)	1	464.7	466	22.5	160	10.0	4.99	,, × 48 × ,,	230	4.88	1370.0	1341.9	3.57	3.41
		2	436.6 / 547.2 491.9		16.0	160	8.5	4.89	,, × 48.5 × ,,	230		1627.0		3.40	
		3	442.8		40.0	160	13.0	4.77	,, × ,, × 30.5	255		1028.8		3.37	
白檜 Shirabe	Fir. (Fine)	1	397.9	420	25.0	140	11.5	3.67	,, × 49.5 × 30	130	4.06	1057.0	1150.1	2.85	3.31
		2	440.1		28.0	160	12.0	4.79	,, × 49 × ,,	230		976.9		2.33	
		3	433.3		32.5	180	12.5	4.73	,, × ,, × ,,	227		1416.6		3.75	
イチヨウ Ichio	Maidenhair or Ginko tree.	1	473.3	481	52.0	150	17.0	4.04	,, × ,, × ,,	193	3.94	745.6	746.6	3.12	3.24
		2	488.8		24.0	120	15.0	3.53	,, × 48 × 29.5	160		729.8		2.77	
		3	482.4		39.0	170	26.5	4.25	,, × 47 × 30	188		764.4		3.85	
樫 Kashi	Oak	1	1035	1017	45.0	380	21.0	10.17	,, × 50 × 29.5	500	9.98	1807.9	1557.3	7.70	7.60
		2	997.5		35.0	340	22.0	9.37	,, × 49 × 30	450		1416.3		7.30	
		3	1019.5		39.5	390	20.0	10.40	,, × 50 × 30	520		1447.8		7.80	
栗 Kuri	Chestnut	1	634.5	651	16.0	.....	.....	6.04	,, × 49 × ,,	290	5.32	1770.8	1671.9	.....	.....
		2	655.4		16.0	.....	.....	5.90	,, × 50 × 30.5	300		1748.6		.....	
		3	663.9		12.0	.....	.....	4.03	,, × 49.5 × 30	240		1496.4		.....	
柳 Yanagi	Willow	1	534.2	531	22.0	120	13.3	3.33	,, × 49 × 30	160	4.22	590.3	794.0	2.50	3.31
		2	523.7		44.0	159	14.0	4.66	,, × ,, × 29.5	220		847.4		3.10	
		3	536.3		40.0	160	14.0	4.68	,, × ,, × 30	225		944.4		3.33	
欅 Keyaki	Planera	1	641.5	639	70.0	200	14.0	7.08	,, × ,, × ,,	340	6.53	1231.8	1116.1	6.16	5.02
		2	636		46.0	240	22.0	7.11	,, × ,, × 29	330		1332.2		5.10	
		3	640		39.0	200	17.0	6.40	,, × 50 × 30	270		784.3		3.80	
山桐 Yamagiri	Wood oil tree	1	593.8	588	31.0	200	17.6	5.41	,, × 49 × ,,	260	5.15	1486.2	1547.6	4.16	4.08
		2	592.8		28.0	190	18.0	5.21	,, × 48 × ,,	240		1581.0		4.12	
		3	579.6		27.5	190	12.5	5.83	,, × 49 × ,,	280		1574.0		3.95	
柘 Tsuge	Boxwood	1	721.8 / 794.3 788.1	839	66.5	100	13.0	5.49	,, × 45 × 27	200	4.78	781.6	680.8	2.74	2.58
		2	915.3 / 833.2 874.5		33.5	90	16.0	3.31	,, × 46 × 30	140		535.1		2.13	
		3	862.8 / 846.4 854.6		5.0	110	13.5	5.55	,, × 45 × 28	210		725.8		2.91	

Japanese Name.	English Name.	No. of Expert.	Weight per Cubic Metre in Kilogrammes.	Average.	Dimension of Bar.	Breaking Weight.	Ultimate Deflections.	Load at Limit of Elasticity.	Deflection at Limit of Elasticity.	Calculated Breaking Strength.	Average.	Calculated Modulus of Elasticity.	Average.	Calculated strength at Limit of Elasticiy.	Average.
朴 Hônoki	Magnolia	1	551.9	553	,, × 49 × 30	300	39.0	240	19.0	6.25	5.80	1574.0	1286.4	4.99	4.60
		2	554.2		,, × ,, × ,,	270	34.0	200	16.0	5.62		1011.9		4.16	
		3	552.1		,, × 48.5 × ,,	260	28.0	220	19.0	5.53		1273.3		4.67	
桂 Katsura	Cercidiphyllum	1	589.8	604	,, × ,, × ,,	245	57.0	140	8.5	5.21	5.74	1331.2	1217.1	2.97	3.46
		2	593.8		,, × 48 × 29.5	265	50.0	160	15.0	5.85		901.5		3.53	
		3	630.7		,, × 48.5 × ,,	285	63.0	180	14.0	6.16		1418.2		3.89	
桐 Kiri	Paulownia	1	311.5	329	,, × 49 × 30	185	40.0	140	15.5	3.85	3.64	745.6	854.8	2.91	2.91
		2	331.5		,, × 48 × 29	180	33.5	140	14.0	4.04		1039.3		3.14	
		3	333.6		,, × ,, × ,,	180	38.0	120	15.5	4.04		779.5		3.69	
柿 Kaki	Persimmon	1	809.5	768	,, × ,, × 30	425	56.0	130	15.0	9.00	8.01	2511.7	2100.9	6.57	.....
		2	776		,, × 48.5 × ,,	340	21.0	.....	.....	7.23		1638.2		.....	
		3	718.7		,, × 48 × ,,	360	18.0	.....	.....	7.81		2152.9		.....	
黒柿 Kuro-Kaki	(Black) Persimmon	1	618	641	,, × 50 × ,,	160	20.0	.....	.....	3.20	3.73	568.5	607.2	.....	.....
		2	700.6		,, × 48.5 × ,,	200	21.5	.....	.....	4.25		836.7		.....	
		3	605.9		,, × 49 × ,,	180	44.0	.....	.....	3.75		416.6		.....	
櫻 Sakura	Cherry	1	628.5	637	,, × 49.5 × ,,	360	30.0	.....	.....	7.65	6.39	1194.8	1314.1	.....	.....
		2	648.3		,, × 48.5 × ,,	370	35.0	.....	.....	8.00		1460.9		.....	
		3	634.2		,, × 49 × ,,	170	9.5	.....	.....	3.54		1287.8		.....	
梅 Mume	Plum	1	703.7	[illegible]	,, × 48.5 × 28	210	8.5	.....	.....	4.69	4.09	3137.8	1891.8	.....	.....
		2	[illegible]		,, × 48 × 29	150	16.5	.....	.....	3.36		820.5		.....	
		3	893		,, × 49 × 29	248	22.5	.....	.....	4.24		1677.2		.....	
楠 Kusu	Camphor	1	698.4	640	,, × 49.5 × 30	60	30.0	.....	.....	1.22	1.29	171.7	213.0	.....	.....
		2	607.6		,, × 49 × ,,	63	22.0	.....	.....	1.31		252.9		.....	
		3	613.3		,, × ,, × ,,	59	21.5	.....	.....	1.22		214.6		.....	
槐 Yenju		1	608.7	600	,, × 48.5 × ,,	395	55.0	300	24.0	8.39	7.49	1464.3	1138.7	6.37	5.79
		2	599.6		,, × ,, × ,,	365	43.0	280	22.0	7.76		1126.3		5.95	
		3	591.1		,, × 50 × 28.5	300	37.0	240	26.0	6.32		825.6		5.05	
ケンポ梨 Kempo-Nashi	Kempo, Pear Tree	1	623.7	634	,, 49 × 30	395	47.5	260	15.0	8.22	6.67	1888.8	1398.9	5.41	4.75
		2	663.9		,, 48.5 × ,,	345	36.5	240	17.5	7.33		1331.2		5.10	
		3	614.7		,, 47 × 29	276	62.5	160	17.0	6.46		976.8		3.74	
百日紅 Saru-Suberi	Crape Myrtle	1	854.3	852	,, × 49 × 30	295	43.0	180	13.0	6.14	7.25	1180.0	1417.1	3.75	4.60
		2	863.5		,, × 49.5 × ,,	400	47.0	260	15.5	8.15		1717.6		5.30	
		3	838.7		,, × 48.5 × 29.5	345	64.0	220	18.5	7.46		1353.7		4.75	

Japanese Name.	English Name.	No. of Expert.	Weight per Cubic Metre in Kilogrammes.	Average.	Dimensions of Bar.	Breaking Weight.	Ultimate Deflections.	Load at Limit of Elasticity.	Deflection at Limit of Elasticity.	Calculated Breaking Strength.	Average.	Calculated Modulus of Elasticity.	Average.	Calculated strength at Limit of Elasticity.	Average.
黒部杉 Kurobe-Sugi	Cryptomeria Species	1	399.9	391	,, × 49 × 30	220	29.0	170	14.0	4.59	4.59	944.4	1051.3	3.54	3.28
		2	385.3		,, × ,, × 29.5	220	26.0	160	13.0	4.66		1029.0		3.39	
		3	388.5		,, × 49 × 30	218	32.0	140	9.5	4.54		1180.6		2.92	
密目櫻 Mitsume-Sakura	Close-grained cherry	1	570 648.7 728.1 680.8 609.3	647	,, × 49 × 30	410	37.5	340	25.5	8.54	7.93	1089.7	1121.5	7.00	6.50
		2	704.4		,, × 50 × ,,	380	30.5	330	23.5	7.60		1025.6		6.40	
		3	627.9		,, × 49.5 × ,,	370	32.0	300	21.5	7.54		1249.2		6.11	
唐檜 Tōhi	Fir. (White Wood)	1	469.4	480	,, × 49 × 29.5	250	39.0	180	18.0	5.09	5.33	800.4	962.2	3.81	3.90
		2	466.6		,, × ,, × 30	275	32.0	200	14.0	5.43		1287.8		4.16	
		3	503.4		,, × 49.5 × 29.5	240	27.0	180	18.0	4.68		798.5		3.73	
澤栗 Sawakuri	Chestnut-tree (without nuts)	1	432.8	461	,, × ,, × ,,	135	39.0	80	6.0	2.45	2.92	808.3	640.6	1.63	1.69
		2	457.9		,, × 50 × ,,	180	29.0	110	9.0	3.10		740.7		2.20	
		3	491.9		,, × 49 × 30	125	37.5	60	4.5	2.20		372.8		1.25	
玉楠 Tamakusu	(Ball) Camphor	1	650.5	671	,, × ,, × ,,	300	45.0	200	9.0	6.5	5.58	2361.0	1492.1	4.16	3.40
		2	653.1		,, × 47.5 × 29.5	250	34.0	140	12.0	5.3		988.4		3.15	
		3	709.5		,, × 49.5 × 29.5	235	45.0	140	12.0	4.7		1127.0		2.91	
檜葉 Hiba		1	588.5	577	,, × 47.5 × 30	300	49.0	180	15.0	6.5	6.10	971.9	.....	6.20	4.98
		2	506.2		,, × ,, × ,,	255	45.0	200	1.0	5.65		1036.7		4.43	
		3	636.8		,, × 46 × 29.5	250	57.5	210	8.0	5.01		580.4		4.32	
破竹 Hachiku	Bamboo	1	.3549	Weight in Kilograms. mm mm .342LD²	1m Mean Dia. 62½mm Mean thickness 7.5 mm	340	28.5	.....	.....	1.39	1.91 $\frac{d^3}{l}$	.0009918	Deflection. L=length in mm D=External diam. W=Load in kilos. .000656 $\frac{l^3}{d^4}$	.....	.....
		2	.3145		1m ,, ,, 50 mm ,, ,, 5.5 mm	270	34.0	.....	.....	2.16		.0005937		.....	
		3	.3582		1m ,, ,, 55 mm ,, ,, 6.5 mm	365	25.0	.....	.....	2.19		.0003843		.....	
モウソウ竹 Mōsō-Take		1	.3715	mm mm .383 LD²	1m ,, ,, 57 mm ,, ,, 6.5 mm	307	29.5	.....	.....	1.66	1.84 $\frac{d^3}{l}$	.000501	.0006446 $\frac{l^3}{d^4}W$	.....	.....
		2	.4152		1m ,, ,, 58.5mm ,, ,, 9 mm	480	28.0	.....	.....	2.39		.000585		.....	
		3	.3612		1m ,, ,, 58 mm ,, ,, 7 mm	289	41.0	.....	.....	1.48		.000848		.....	
眞竹 Matake		1	.2825	mm mm .245 LD²	1m ,, ,, 63.5 mm ,, ,, 7.25mm	280	12.0	.....	.....	1.11	1.04 $\frac{d^3}{l}$	.00048	.0006533 $\frac{l^3}{d^4}W$	.....	.....
		2	.2652		1m ,, ,, 58.25mm ,, ,, 4 mm	160	16.0	.....	.....	0.69		.000823		.....	
		3	.1873		1m ,, ,, 51.0 mm ,, ,, 5 mm	200	13.0	.....	.....	1.32		.000657		.....	
黒竹 Kuro-Take		1	.2081	mm mm .244 LD²	1m ,, ,, 50.5mm ,, ,, 6 mm	181	31.0	.....	.....	1.44	1.286 $\frac{d^3}{l}$	.00078	.0006756 $\frac{l^3}{d^4}W$	.....	.....
		2	.2747		1m ,, ,, 49.5mm ,, ,, 3.75mm	132	17.0	.....	.....	1.08		.0006		.....	
		3	.2294		1m ,, ,, 45.5mm ,, ,, 3.75mm	127	24.0	.....	.....	1.34		.00053		.....	

ON SOME COPPER BELLS.

BY

KANDA TAKAHIRA,

The Governor of Hiogo *Ken*.

Read before the Asiatic Society of Japan, on the 20th October, 1875.

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These copper bells are of a description that has frequently been dug out of the ground in Japan. There are no trustworthy traditions with regard to the use to which they were put in very ancient times. One report is to the effect that they were suspended from the corners of the roofs of temples or pagodas, and this is the opinion that I myself hold; but still, the fact that upon the dragon-shaped handle there have not been left any marks of friction of some other metal fastening affords grounds for doubt. These copper bells have only been dug out of the earth, and there is no instance known of one having been handed down from olden days *above* the ground. The localities in which they have been found have mostly been to the west of Kawachi, Tôtômi, in the five Home Provinces, the Central Provinces, and in Shikoku. Nothing has been heard of their being discovered in the circuit to the east of the Hakoné Barrier, in the Aok'kaidô, or in Kiushiu. Their size, also, differs considerably. The very largest go so far as four or five feet, while the smallest are but one or two inches. Their apparent shape is for the most part similar, except that in some

cases there may be slight differences in the pattern of the outer surface. These slightly different specimens are of greatly enhanced value in the eyes of Japanese antiquarians, the reason being that they are thus enabled to offer them as a basis for speculation regarding traces of very ancient times. The first instance of the discovery of a copper bell is of exceedingly old date. A short time ago I visited a friend of mine, Mr. Yokoyama Yoshikiyo, a widely read and well informed antiquarian, and questioned him on the subject, when I obtained from him a written reply that is of great importance. This I give below:—In Vol. 5 of the "Fusô-riyak'ki" it is stated that on the 17th day of the 1st month of the 7th year of the Emperor Tenji's reign—corresponding to the year 669 A.D. of the foreign calendar—when the temple of Sô-fuku-ji was being erected in the Department of Shiga and province of Ômi, and the earth was being preparatorily levelled, a strange and valuable bell was dug up from the ground. Its height was 5 ft. 5 in. There was also dug up a wonderful kind of white stone, 5 inches in length, which shone brightly at night.

Again, in Vol. 6 of the "Nihonki" we find it said that in the 7th month, in the autumn of the 6th year of the period Watô, corresponding to the year 714 A.D. of the foreign calendar, during the reign of the Emperor Gemmei, a person named Muragimi Adzumando,—a *Taishôi no-jô*,*—belonging to the village of Namisaka, in the Department of Uta and province of Yamato, found, in the uncultivated district of Nagaôka, a copper bell, which he accordingly offered up (to the Emperor). It was three feet in height, and measured one foot across the diameter of the mouth. Its style of manufacture differed from that ordinarily known, and its sound came under the *ritsu* and *riyo* tones. Orders were given by the Emperor to the officials to lay it up in the storehouse.

In the 2nd part of Vol. 11 of the "Nihonkiriyaku," it is stated that in the 5th month of the 12th year of the

* A title of rank.

period Kônin,—corresponding to the year 822 A.D. of the foreign calendar,—during the reign of the Emperor Saga,—as a man in the province was digging in the ground he discovered a copper bell. It was 3 ft. 8 in. in height, and the diameter of the aperture was 1 ft. 2 in. The people styled it the Bell of King A-iku's† Pagoda.

Again, in Vol. 11 of the "Nihongôki," we read that in the 6th month of the 9th year of Shôwa,—corresponding to the year 843 A.D. of the foreign calendar,—there was presented (to the Emperor), from the Province of Wakasa, a copper utensil that in shape very nearly resembled a bell, which had been dug up from out of the ground.

In Vol. 4 of the "Sandai Jitsuroku" it is stated that on the 14th day of the 8th month of the 2nd year of Jôkan,—corresponding to the year 861 A.D. of the foreign calendar,—there was presented to the Emperor, from the Province of Mikawa, a copper bell. It was 3 ft. 4 in. in height, and one foot four inches in diameter, and had been discovered in the hill called Muramatsu in the Department of Atsumi. It was observed by some one, "This is a precious bell of King A-iku."

Apart from the above, there must also be other instances. The fact of King A-iku having in one single day erected 84,000 pagodas is mentioned in Vol. 4 of an old book called "Konjaku Monogatari," and in Vol. 13 of that called the "Jinkaishô &c. &c. The first mention of him is made in Vol. 3 of "Shokiyo Yôshiu," but as this is a long affair, it is not fully given here.

(Signed) YOKOYAMA YOSHIKIYO.

Many years after the above, during the period of Tenshô (1573-92 A.D.) a copper bell was dug up in the Province of Yamato, and was presented to the Taikô, Toyotomi. The Taikô regarded this as an object of great value, but afterwards conferred it, as a reward, upon a general who had achieved some great exploit. In the times of the Tokugawa family, during the period of

† Name of an Indian Ruler, who erected many pagodas. v. inf.

tranquillity and peace, those bells that were dug up were very numerous. Sixty or seventy years ago, there lived an antiquarian called Yashiro Taró, who held the office of historian to the Bakufu. He was a man of profound knowledge and a lover of antiquities; and he collected together drawings of several tens of these copper bells, and made them into a volume, which he offered as a basis for speculation (about these bells.) Unfortunately, however, these were not engraved on blocks, and so there are at present very few persons to whom (copies of) this volume have descended. Just now there is no lack of persons who are in possession of these copper bells. They are frequently sold at the old utensil shops in the three cities (Yedo, Kioto and Osaka), and their price, too, is not excessively dear, which is a proof of the numbers that have been dug up. The articles that have been handed down from antiquity in my country (i.e. Japan) are of three kinds,—stoneware, earthenware and copper arms. The stone articles found are: *raifu*,‡stone swords, flint arrow-heads, &c.,—among the earthenware sacred jars,§—and among the copper ones small round bells *(sudzu)*, copper swords, and copper bells (like the present). Constant enquiry has from olden times been set on foot by Japanese literati with regard to these various articles, but still, down to the present time, there has not been found anyone able to give clear explanations either as to their age, their owners, or the purposes for which they were used. My own opinion is that the one point to be investigated over and above these, is the single question as to whether such articles as these do or do not exist in countries beyond our own seas, and especially in China, Corea, Manchuria, &c. If enquiry be made into my reason for this, it is that supposing, in those other countries, there should exist similar articles, then this would afford a proof of the common origin of the ancestors of those nations and of our own. I have not, however, been able as yet to effect this search, and this is a matter for which I feel con-

‡ Evidently a kind of axe.

§ Apparently those used at Shintô festivals.

stant regret. I have heard that in Yokohama some learned foreign gentlemen have established a Society for the purpose of investigating Asiatic antiquities, and I think that some decisive conclusion may be arrived at by that Society with respect to the above three kinds of articles. I consequently now beg the kind offices of the English Minister, Sir Harry S. Parkes, and send to the Society a copper bell that has been kept in my possession for a long time, with the desire of inviting discussion thereon. Should the various gentlemen belonging to the Society hold any opinions on the subject, let them be so good as to make them known. If, in consequence of their exertions, it come to pass that we obtain some basis for ascertaining the place from which the ancestors of the Japanese people originally came, no small benefit will be conferred upon the land, and it will be a matter of rejoicing not to myself alone.

Written in Hiogo by

KANDA TAKAHIRA.

May 10th, 1875.

USEFUL MINERALS & METALLURGY OF THE JAPANESE.

D.—QUICKSILVER.

BY

DR. GEERTS.

Read before the Asiatic Society of Japan on the 20th day of October 1875.

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LITERATURE.—*Kaempfer's*, History of Japan I Book, Chap. VIII. *Thunberg*, Voyage au Japon, traduit par *Langlès*, Paris, 1796, Vol. III p. 440. *Stan. Julien A Champion*, Industries, &c., Paris, 1869, p. 58, Tabula III. [This table is an exact copy of the figure in the Chinese Technology *Ten-ko-kei butsu*]. Japanese Edition of the Chinese Technology TEN-KO-KEI-BUTSU, Vol. VIII, Tab. 11 and 12—天工開物 (Chinese: "Thien-kong-khaï-wu"). Natural History: HON-ZO-KO MOKU, Vol. IX, Fig. 23 and 24—本草綱目 Chinese: Pun-tsaöu-kang-muh) by *Li-shi-chin* ONO RANZAN. *Hon zo-ko moku Kei-mo*, 本草綱目啓蒙 Ed. 1847, by *Ono-Tsunenori* and *Te ken-shi-yeki*.

The metallurgy of mercury has never reached any great degree of importance in Japan, because the chief quicksilver-ore—natural cinnabar—does not seem to be found in sufficient quantities, to make the separation of the metal a profitable industry. Since the opening of Japan to foreign trade especially, nearly all mercury used in this country has been imported from Europe or America. In former times the Chinese of Nagasaki also imported Chinese-made mercury into Japan, but now, even the Chinese, notwithstanding they have large quantities of

cinnabar in their own country, buy foreign quicksilver, because it is much purer and relatively cheaper than their own metal. In former times small quantities of mercury were distilled at the island *Hirado* (province of Hizen), in Nagasaki and Osaka, but now these manufactories are wholly given up.

The only quicksilver ore I have met with in Japan is the cinnabar or sulphide of mercury, (Japanese *Shin-sha*, 辰砂 *Tan-sha* 丹砂. Syn. *Ri-se, Meï-ko-jin, Shu-sha*). I saw only a few specimens, consisting of amorphous masses of a dark brownish-red colour. According to Ranzan it seems to occur sometimes in Japan in a sandy small crystalline form, but I have only seen *Chinese* cinnabar in this state. Cinnabar was known in China since the earliest times and much esteemed as a wonderful, mysterious, celestial substance, which could give liquid silver, when heated. The old Egyptians with their Hermes Trismegistos—the mysterious founder of chemistry and the school of Stagyrical philosophers, in whose mysterious grave the "Tabula Smaragdina" should have been detected by Alexander the Great, bearing the inscription "*Itaque voc a tus sum Hermes Trismegistos habens tres partes Philosophiæ totius mundi*"—the old Egyptians, I say, have very probably known cinnabar, although Theophrastos (371 B.C.) gives us in his work on minerals *(Peri lithōn)* the first information about this substance. It is a remarkable fact that the Chinese had even in the second century before our era considered the cinnabar as a celestial or fairy substance (Sen-tan 仙丹 *Chinese Siën-tan*) and have used the same in their alchemical pursuits to find "the medicine of immortality" or *elixir vitæ* of our western alchymists. If we may believe Mr. Edkins* it would seen certain that Ko-hung, a Chinese writer on alchemy, and editor of the book *Pau-p'uh-tsi-p'ian*, printed in the 4th century A.C., gives different minerals and herbs which ought more or less to possess the properties of a

* Transactions of the China branch of the Asiatic Society, (Hongkong) Vol. V. 1855.

celestial medicine. The best of all, however, was considered by this Chinese writer to be cinnabar. Mr. Edkins' translation of a part of this as regards cinnabar runs as follows: "When vegetable matter is burnt it is "destroyed, but when the *tan-sha* (cinnabar) is sub-"ject to heat it produces mercury. After passing through "other changes it returns to its original form. It differs "widely, therefore, from vegetable substances, and hence "it has the power of making men live for ever, and rais-"ing them to the rank of the Genii. He who knows this "doctrine is he not far above common men? In the "world there are few that know it, and many that cavil "at it. Many do not know that mercury comes out of "cinnabar. When told, they still refuse to believe it, "saying that cinnabar is *red*, and how can it produce a "*white* substance? They say also that cinnabar is a "stone, that stones when heated turn to ashes, and how "can anything else be expected of cinnabar? They can-"not even reach this simple truth, much less can it be "said of them that they have been instructed in the doc-"trine of the Genii." It is in every case a fact that the Chinese had some alchemical literature anterior to the period when alchemy was studied in Egypt and the West; now, if we take this fact in relation with others it becomes very probable that the Egyptians, and later the Europeans, got the first idea of alchemy from China. We find, in fact, the earliest notices of alchemical pursuits, that is to say of the art of goldmaking *(Kruso Poia)* in the works of Greek authors after the 4th and 5th century. They speak of this art as having originated in Egypt. In the *Historia Naturalis* of Pliny the Younger (Born 23, A.C.) *Liber* 33 *Cap* 32, mercury (*argentum vivum S. Hydrargyrum*) is referred to as a "*venenum rerum omnium*" and he also mentions cinnabar. Dioskorides (50 A. C.) mentions in his Materia Medica *(Peri Glēs Iatrikēs)* the preparation of mercury from cinnabar, but neither of these two authors have related anything of the art of goldmaking or alchemical pursuits, so that we may conclude that in their time alche-

my was yet unknown in the West. The Arabians of the eighth and ninth century occupied themselves ardently with alchemy and brought this pseudo-science in 711 to Spain. We see, therefore, that the Chinese have decidedly led the way in alchemical pursuits, and may believe that the West obtained the idea of goldmaking from the inhabitants of the Celestial Empire. There are several grounds for this opinion, the chief of which is that the Persians often came to China at the beginning of our era. After the invasions of the Mohammedans of Persia, the Persians continued their intercourse with China. Persian, Arabian and even Greek embassies from Constantinople visited from time to time the Chinese Court at *Shensi*.† Arabian merchants settled in several Chinese ports and had frequent intercourse by sea with the ports near the Persian Gulf. It is for this reason very probable that an art so full of interest as the art of goldmaking was introduced into Persia from China, and from that country to Egypt and the countries of Asia Minor.

In Japanese books we have not found any trace of alchemy. According to Ranzan cinnabar was, for the first time, used in Japan in the year 629 A.C. (the 2nd year of Mon-mu Tenno). At this time the Chinese no longer occupied themselves much with alchemy, although the later Chinese works still speak of cinnabar as the first substance of all minerals, because it can transmute, in equal periods of two hundred years, into each of the five principal metals, finishing with gold. I have never seen in Japan natural mercury (in the metallic state) as it is found in some countries as natural minute globules. Neither have I met with samples of natural quicksilver amalgam.

Metallurgy of Mercury.

Like most of the other metallurgical processes, the Japanese also learned the use of cinnabar and the distillation of mercury from the Chinese. Their method is nearly an

† Duhalde. *Description de l'Empire de la Chine* Vol. I p.q. 5. *La Haye* 1736.

exact copy of the process described in the well-known Chinese Technology *Ten-ko-keï-butsu*.

The cinnabar is first powdered by means of an iron boat-shaped mortar with a circular knife (the same as is used by Japanese druggists and called *Ya-gen* 薬研.) It is then washed to remove the foreign stones and to obtain the cinnabar in a finely-powdered state. This is, after being dried, mixed with an equal weight of half-burned charcoal (half coal and half ashes) and the whole is put into an iron pot, which is carefully covered with a round iron cover. This cover has in the middle a round opening, into which a curved tube of plate-iron is fixed and cemented with a mixture of loam, salt and a little water, the other extremity of the tube ending in a pot filled with cold water. The whole tube is wrapped up in old clothing, or some fibrous substance, and kept cool by the aid of cold water. The whole is gradually heated on a small open charcoal furnace, the quicksilver distilling into the pot of water. This process is founded on the fact that the sulphur of the sulphide of mercury (cinnabar) is retained by the ashes (calcium salts) and perhaps also by the iron of the inner-surface of the pot, the mercury evaporating by the heat. This quicksilver is, however, not pure; heavy mercurial vapours containing always a small quantity of foreign metals (lead, copper etc.) which were also present in the ore.

The chief employment of quicksilver in Japan is in the manufacture of bronze mirrors. Another application is in the art of gilding in the dry way and in the manufacture of different mercurial preparations used in medicine. The Japanese are well acquainted with the method of testing the purity of mercury, by heating a small quantity in a small open iron dish and estimating the amount of non-volatile matter after all the quicksilver has been evaporated. Foreign mercury is justly preferred by the Japanese to the Chinese or Japanese product.

Cinnabar occurs, as far as my own observation extends, in:

Province Hizen, ... *Place* Island of Hirado.
,, Yamato, ... ,, Yoshino-mura.

Ono Ranzan gives, besides, the following provinces, without, however, indicating the localities. I give these with reserve as to their accuracy:

Bizen, Isé, Hitachi, Iyo, Hiüga, Buzen, (at Shimoke-gun), Oshiu, (Sendai).

Cinnabar is imported for medical uses and lacquer-ware from China and the Liu-Kiu Islands.

Appendix.

On some useful Japanese preparations and applications made from Mercury.

Ist. Mirrors.—The manufacture of bronze mirrors consists in first casting the bronze in very neatly and accurately made moulds. The Japanese metal-founder is admirably apt in the art of moulding, and must be praised for his skill in obtaining such accurately cast objects, without the aid of any machinery whatever. For preparing the mould,—which consists of two valves, put together with their concave surfaces,—the workman first powders a kind of rough plastic clay and mixes this with levigated powder of a blackish "Tuff stone" and a little charcoal powder and water till the paste is plastic and suitable for being moulded. It is then roughly formed by the aid of a wooden frame into square or round cakes; the surface of the latter are covered with a levigated half liquid mixture of powdered "*chamotte*" (old crucibles which have served for smelting bronze or copper) and water. Thus well prepared the blackish paste in the frame receives the concave designs by the aid of wood-cuts, cut "in relief." The two halves of the mould are put together in the frame and dried. Several of these flat moulds are then placed in a smelting box, made of clay and *chamotte*. This box has on the top an opening, into which the liquid bronze is poured, after it has been smelted in small fireproof clay crucibles. The liquid metal naturally fills all openings inside the box and

consequently also the cavities of the moulds. For mirrors of first quality the following metal-mixture is used in one of the largest mirror-foundries in Kiôto.

Lead	5 parts.
Tin	15 „
Copper	80 „
	100

For mirrors of inferior quality is taken:

Lead	10 parts.
Natl. sulphide of lead and antimony (*Shirome*) from Choshiu or Iyo	10 „
Copper	80 „
	100

Champion and Pellet give in the Industries l.c. p. 64, the composition of Chinese bronze-mirrors to be:

Copper	50.8
Tin	16.5
Zinc	30.5
Lead	2.2
	100.0

The difference of Chinese and Japanese mirrors is, therefore, very great, and the quality of the Japanese metal superior to the Chinese. After being cooled, the melting box and moulds are crushed and the mirrors taken away. These are then cut, scoured and filed until the mirror is roughly finished. They are then polished first with a polishing powder, called *to-no-ko* which consists of the levigated powder of a soft kind of whetstone *(to-ishi)* found in Yamato and many other places. Secondly, the mirrors are polished with a piece of charcoal and water, the charcoal of the wood *ho-no-ki* (Magnolia hypolenca S.Z.) being preferred as the best for this purpose. When the surface of the mirror is well polished, it is covered with a layer of mercury amalgam, consisting of quicksilver, tin and a little lead. This amalgam is rubbed vigorously with a piece of soft leather, which manipulation must be continued during

a long time until the excess of mercury is expelled and the mirror has got a fine, bright reflecting surface.

The great fault of Japanese mirrors is that they are very soon attacked by obnoxious gases (sulphuretted hydrogen, &c.,) which are always more or less to be found in the air. The mirrors require, therefore, to be repolished from time to time, which is done at a relatively low price. Bronze mirrors which are well made have, however, the great advantage of giving very accurate images of objects, and are very suitable to be used in physical instruments, where great exactness of reflexion is necessary, when the mercurial surface can remain unaltered. The parts of Japan most celebrated for the manufactory of bronze mirrors are Kiôto, Osaka and Nagoya in the province of Owari. Small glass mirrors with tin-amalgam are now also manufactured in Japan in imitation of those of foreign make.

2. MERCURIAL OINTMENT.—Mercury with a little lead is mixed by the Japanese druggists with fat or vegetable wax till they obtain the well known grey ointment, the *unguentum cinereum* or *hydrargyri* of pharmaceutists. In mixing the mercury first with a little lead, the Japanese druggist easily gets over the difficulty of finely subdividing the mercury in the ointment.

3RD. MEDICINE FOR CAUSING ABORTION.—Mercury in the metallic state is sometimes taken by pregnant women as an *abortivum*. It is believed that it can be administered for this purpose with success without danger to the mother. Instead of the liquid, mercury pills are sometimes used, which are made from a tough mass, obtained by boiling quicksilver with hemp-oil.

4. VERMILLION BY SUBLIMATION. *(Sui-gin-ro,* 水銀澇) This substance occurs in crystalline crusts or acicular loose crystals of a fine dark red colour, and is mostly imported from China or the Liu-kiu islands. It is made by smelting and sublimation of various qualities of mercury and sulphur. There are many prescriptions of manufacture varying in the quantity of both ingredients. The *Hon-zo-ko-moku* prescribes the trituration of six parts of

mercury and four parts of sulphur for a long time together, subliming the blackish mixture thus obtained in an iron vessel. According to the chemical constitution of vermillion one part of sulphur to six parts of mercury would be sufficient. This vermillion is extensively used in the manufactory of the red lacquer-ware; it finds also some application in medicine.

5. VERMILLION BY THE WET PROCESS OR BY LEVIGATION.—*(Gin-shu* 銀朱. Syn. *Shin-ko. Sui-kuwa-gin-shu. Shi-fun-so. Seïko.)*

This substance forms a very fine, soft, red powder, with some slight differences in the shade of the red colour according to the quality. The Japanese believe that the best kinds come from China and Liu-kiu. The best Japanese kind is manufactured at Sotogahama, in the province of Oshiu, district Tsugaru; but I have seen even finer specimens prepared by a Japanese in Nagasaki by the wet process, which I shall afterwards describe. In China, Ma-yang in the province of Kui-tchu and Yu-tchu in the province of Tse-tchuen are most famous for the preparation of levigated vermillion. In China and most parts of Japan it is prepared by powdering and carefully levigating the sublimed vermillion, especially that part which is attached to the sides of the cover. When this is thoroughly ground and levigated it gives a beautiful red colour.

In Nagasaki a fine kind of vermillion is prepared by mixing together, in square, strongly stoppered bottles three parts of mercury, one and a quarter of sulphur and six parts of a solution of caustic potash. These bottles are lain in lots of six or eight on a kind of sledge, each bottle in its own compartment; the sledge is regularly and ingeniously moved forwards and backward on a pair of rails, by means of a turning wheel and with driving gear. By this continuous shaking of the contents of the bottle the vermillion is formed within the space of twenty to twenty-four hours. It is carefully washed, levigated and dried on porous stones.

This levigated vermillion is extensively used in China and Japan for stamping and writing purposes, for colour-

ing paper, varnish, candles, &c. After being mixed with glue from cow-hide, small square sticks are formed, which constitute the well known red (vermillion) ink, *Shu-sumi*, 朱墨, used for making corrections of or comments upon printed or written matter. The best sticks come from Liu-kiu.

6. Black Sulphuret of Mercury and Sulphur. (*Rei-sha* 靈砂. Syn. *Niki-tan; Niki-sha. Ki-sha. Koku-sha.*)—This is found sometimes in the drug shops as a black crystalline, striated mass, together with some crystalline powder. It is obtained in the same manner as the sublimed vermillion, the difference being the quantities used in smelting. Five parts of mercury are mixed with three parts of sulphur and then heated. It is recommended in medicines for several diseases, but of late it is seldom used in Japan.

7. Crystalline red Oxide of Mercury. (*Ko-sho yaku* 紅升葯. Syn. *Ko-sho-shaku. Seki-ko-ko. Ko-sho-tan.*) As prepared by the old Chinese method this substance consists of red, heavy, crystalline fragments, mixed with a crystalline powder. We found it to be nearly pure oxide of mercury, with very little nitrate of mercury. It is prepared by subliming a mixture of mercury, nitre, alum and sulphate of iron in small iron bowls, covered with round plates of earthenware in the same way as is done with vermillion. Besides this method there are many other prescriptions, mostly taken from Chinese pharmaceutical books. These preparations are sometimes distinguished by different names, although their chemical constitution is chiefly the same, namely oxide of mercury. Thus a kind consisting of a crystalline powder of red colour is named: *kô-fun* 紅粉 (Syn. *san-sen-tan* 三仙丹). Another kind of a more yellowish colour, which contains a considerable amount of nitrate of mercury is distinguished by the name of *o-sho-yaku*. 黃升藥

At the present time foreign made oxide of mercury replaces more and more the old Chinese or Japanese pre-

paration. In Nagasaki oxide of mercury is now being made after the foreign method by heating quicksilver with nitric acid. This is ordinarily called *Pŭreshipitātŭ* after the Dutch name "*precipitaat.*"

8. IMPURE PROTOCHLORIDE OF MERCURY.—(*Kei-fun* 輕粉. i.e. "Light powder." *Sui-gin-fun* 水銀粉. Syn. *Kiyo-fun*, *Harahe*, *Haraya*, *Tsé-oshiroï*, *Ha-shiroï Sui-gin-saku*, *Gin-fun*, *Sui-fun*.)

This interesting preparation was known since the earliest ages to the Chinese, long before we in Europe had any knowledge of calomel or corrosive sublimate. Our first knowledge about both the chlorides of mercury date from the time of the Arabian chemist Geber ‡ who has given a prescription which differs but slightly from the old Chinese method of preparing *kei-fun*. The product obtained by Geber's method is a mixture of calomel with a little corrosive sublimate, whilst the Chinese knew how to prepare calomel (*kei-fun*) and a kind of corrosive sublimate (*sho-ko*) each separately. Until the 16th century we did not make in Europe a careful distinction between these two chlorides of mercury. Libavius and Oswald Crall first prepared pure calomel (1606-1608) under the names of *Draco mitigatus*, *Manna metallorum* or *Mercurius dulcis*. It seems very probable that the old Egyptians learned also the preparation of this substance from the Chinese, and we believe that there could be found many proofs of the influence exercised by old Chinese works on the sciences of the West, if the numerous volumes of the old library of Alexandria had not been so barbarously burnt.

According to Ranzan *kei-fun* was for the first time manufactured in Japan in the year 714 in the province of

‡ *Gebri* de invent. veritat. cap. 8, pag. 270, editio 1572, or cap. 8, p. 173 ed. 1545.

"[illegible] sublima. Sume de eo libram unam, vitrioli [illegible], aluminis rochae calcinate libram unam et salis "communis libram semis, et salis petrae quartem partem et incorpora- "tum sublim[illegible], densum, clarum et ponderosum, quod "circa vasis [illegible] fuerit, et serva, ut tibi de aliis scripsi- "mus. Sed si in prima sublimatione inventum fuerit turbidum vel "inmundum, quod tibi accidere potuit propter tuam negligentiam, illud "cum eisdem fecibus noveris iterum sublimare te serva."

Isé. It was then presented to the Empress Gen-miyo, who reigned at that time. Remarkably enough the preparation of this substance has regularly been effected in this province up to the present time and the *Isé-oshiroi* (cosmetic of Isé), as this calomel is sometimes called, has even largely contributed to the glory of the celebrated temples of Isé. Many of the travellers recovered their health or that of their parents, by the use of this important medicine, and attributed the excellent medical properties of this substance largely to the *kami* of Isé.

The Chinese or Japanese calomel occurs according to its quality in fine, brilliant, transparent, flat crystal plates, or as a crystalline powder. Although pure when it is properly made, it is very often—we could say nearly always, adulterated with variable quantities of small crystalline gypsum, (*selenite*) or with mica-powder, or with both these substances. I once found even more than one-fourth to consist of sulphate of lime, and we have very seldom met with pure *kei-fun*. It is prepared to some extent in Japan (Isé, Osaka) but it is also imported in considerable quantity by the Chinese merchants of Nagasaki. The mode of preparation is the following.

Two parts of alum, one part of mercury and one part of common salt are mixed in a mortar with a little water until a very accurate mixture is obtained, in which no globules of mercury can by perceived. After being dried this mass is placed in an iron bowl, which is closed with a mixture of earthenware, carefully plastered with a mixture of loam, ashes and salt. The whole is then gradually heated on a charcoal fire and the covering plate in the meantime cooled with wet cloths. The calomel sublimes within four to five hours on the inner side of the cover as a very porous, light, crystalline, powder. The more the sublimate has a light, soft and porous appearance, the more it is esteemed. There are several other prescriptions for preparing this salt, which are kept secret by the manufacturers. The above prescription is given by the large Chinese Materia Medica *Pun-tsao-kang-muh* (Japanese *Hon-zo-ko-moku*). The sulphate of lime, or

selenite and mica-powder are added afterwards purposely to make this expensive mercurial preparation heavier and cheaper.

If the calomel thus obtained has undergone a second and third sublimation, it is thought to be much better and bears then the name of *Fun-sô* 粉霜 (Syn. *Ushu oshiroï. Isé-oshiroï-no-yaki-kayeshi. Kin-yeki.*) This substance is really calomel in small, soft, tubular crystals.

The *kei-fun* is found in every Japanese drug-shop, packed in oblong square wooden boxes or black shining paper. It is a medicine which is extensively used and often abused by excessive doses, so that the number of sufferers by mercurial poisoning, or the effects of so long protracted use of quicksilver preparations, is by no means small in Japan.

Foreign-made calomel is now more and more becoming popular, especially in the open ports and those places where the influence of the Dutch medical school has been of some importance. The Japanese distinguish this preparation by the name *karomeru* or *kan-ko* 甘汞. In Osaka and Kiôto calomel is also prepared after the foreign manner.

9. Impure bichloride of Mercury.—(Corrosive sublimate) (*Sko-ko* 青乳. Syn. *Seï-seï-niu, Haku-yo-tan, Haku-ko*).

This substance forms crystalline, sublimed masses, often bearing on one side the convex form of the vessel, in which it is sublimed. Sometimes it is found in fine, acicular crystals of the rhomboidal systems, which are obtained by crystallisation out of an aqueous solution. These rhomboidal prisms bear ordinarily the name of *seï-seï-niu.* There are many different and very complicated prescriptions for preparing this highly poisonous substance. Some Japanese manufacturers take variable quantities of mercury, nitre, borax, sal-ammoniac, yellow sulphide of arsenic, cinnabar and oxide of lead.

In Nagasaki a Japanese manufacturer uses the following, rather ridiculous compound prescription :

Arsenious acid.....	(Yo-seki)	3	Monmé	
Powder of Mica.....	(Ummo)	2.5	,,	
Saltpetre	(Sho-seki)	16.	,,	
Mercury	(Sui-gin)	2	,,	6 fun.
Alumen	(Ban-seki)	12	,,	
Blue Iron vitriol.....	(Roku-ban)	18	,,	
Dry salt	(Shiwo)	15	,,	
Copper-vitriol	(Tan-pan)	5	,,	6 fun.
Salt of wells	(Seĭ-yen)	3	,,	6 ,,

The quicksilver is first mixed intimately with the arsenious acid and then the other materials are gradually added. The whole mixture is sublimed in the same manner as is already described under calomel. It is difficult to trace the exact chemical reaction which takes places in this quite unnecessary compound mixture, but it is chiefly as follows. The saltpetre oxidises the mercury at the high temperature, the sulphuric acid of the iron, vitriol and alum combine temporarily with the oxide of mercury, and the sulphate of mercury is converted by the salt into chloride of mercury which sublimes together with some arsenic-acid in the inner surface of the covering plate. It is believed that the arsenic neutralizes in a certain degree the injurious properties of the mercury!

When crystallized out from the aqueous solution this impure, arsenical chloride of mercury loses a little arsenic, so that the acicular crystals of *seĭ-seĭ-niu* may be regarded as a little less poisonous.

At the present time this old Chinese preparation is displaced by foreign-made corrosive sublimate. Many Japanese doctors, more or less accustomed to the foreign art of medicine, now use our bichloride of mercury, but often, alas, in immoderate quantity. The foreign preparation bears the name Mō-kō or ordinary *Supŭri* 孟汞, the last name being a corruption of the Dutch word "*Sublimaat.*" In Osaka and Kiôto, and perhaps also in other parts of Japan, corrosive sublimate is now prepared after the foreign method.

ASIATIC SOCIETY OF JAPAN.

A General Meeting of the Society was held at the Kaisei-Gakko on the 20th instant. The Chair was taken by Sir Harry Parkes.

The Chairman opened the proceedings by drawing attention to a supposed ancient bell, presented to the Society by the Kenrei of Hiogo. Quite a number of similar bronzes had been found in Japan presenting this peculiarity, that they are always found buried, and also that Japanese antiquaries, though familiar with their appearance, were entirely ignorant of their history. The size of these bronzes varied from two inches to five feet. He had seen a very large specimen exhibited at Nara. The present bronze was found by a priest in a hole in a rock. It had been questioned whether these bronzes were Chinese, and therefore the bronze before them was sent for inspection to Mr. Meadows, H. B. M. Consul at Shanghai. The bronze was afterwards forwarded to Dr. Bushell of Peking who had made bells his special study. Neither of these gentlemen however could give any information. He believed that it was of very early date and would prove to be of Corean origin, but the present disturbed state of Manchuria rendered research in that part of the globe impracticable for the present.

Mr. Syle proposed, "That the Secretary be requested to address "a communication to the German Asiatic Society, inviting the "the attendance of its members at our General Meetings, whenever "they may find it convenient."

This proposal was seconded by Professor Grigsby and carried unanimously.

Professor Smith rose to propose that a Physical Sub-section be formed in the Society, to facilitate research and summarise papers that *in extenso* are too technical to be of interest to a majority of the members.

Dr. Antisell thought a body such as proposed should organize itself independently of the larger Society, and, when it had achieved existence, become affiliated to the Society.

Prof. W. E. Ayrton proceeded to read Dr. Geerts' paper on Useful Metals and Minerals of the Japanese (D. Quicksilver.)

In reply to a question from the Revd. E. Syle, Dr. Antisell remarked that the geological position of mercury or its ores could not be exactly stated; it was found running through a large range of deposits. Thus, at Idria it was found in bituminous shale of the older transition series (Silurian); at Almaden in Spain in mica schists broken up, and porphyritic granitic intrusions more recent than the coal deposits; in new Almaden and other points in California it is found higher up in the Newer Cretaceous or Older Tertiary (Eocene) beds, giving thus too great a range to warrant locating it in any exact series.

In this it resembles petroleum, which is found in the older states as well as in the Kainozoic series.

The meeting terminated with an account given by Prof. Smith of the method he had employed for testing the strength of woods, and the results thereby attained.

Owing to the lateness of the hour the Meeting was adjourned to a Special Meeting, to be held on Wednesday, October 27th, when the paper read on the afternoon of the 20th instant might be discussed.

ON SOME JAPANESE WOODS.

BY

J. A. LINDO, Esq.

Read before the Asiatic Society of Japan, at Yedo, on the 27th October, 1875.

——:o:——

The following particulars on Japanese woods have been gathered from an article in the Proceedings of the Royal Institution of Engineers in Holland, by Mr. Akamats, at the present moment a Rear-Admiral in the Japanese Navy. Thinking they might be some value to the Society, I asked Mr. Akamats' consent to make an extract from his article for the Asiatic Society, which he very willingly gave me.

2. *Hibanoki.*—Grows in clayey ground, more especially where rocks are under the surface; at 250 to 300 years of age, the trees are from 30 to 35 meters in height and 3 m. to 3½ m. in circumference. Of these trees timber of very large dimension is to be had; it resists well enough to alternate dampness and drought, is almost everlasting under water, very elastic and easily worked. In ship-building it is used for decks and outside parts; in house-building for uprights and doors. The timber of this tree comes principally from the provinces of Suruga and Kai. Specific gravity 0.560.

2. *Hinoki.*—Grows in red clay; spread all over the country, but more particularly to be found in Mino and

Owari ; large quantities and dimensions in trade ; somewhat resinous ; more elastic than *hibanoki* ; for the rest same qualities as this latter. Specific gravity 0.421.

3. *Suginoki* (Cedar wood).—To be found in large quantities between degrees 32 and 40 N. L., moist ground. At 150 to 200 years of age, furnishes timber of tolerable dimensions. Height of full-grown tree 40 to 45 meters ; circumference 5 to 6 m. Does not stand alternate damp and dryness as well as *hibanoki*, being much more liable to extending and shrinking by the influence of weather. Durability under water next to *hibanoki*; elastic and difficult to be worked. In shipbuilding used for lining purposes ; in house-building for beams, ceilings, uprights and lining. Specific gravity 0.416.

4. *Akamats*.—Grows in sandy dry clay ; spread throughout the country, especially in Hiuga ; this wood is renowned for its very fine appearance. If grown in wet ground the timber is white and of inferior quality. Height 35 to 45 m. ; circumference 4 to 5 m. at 250 to 300 years of age. Even larger dimensions are to be found, but in this case the wood is more liable to wet-rot. Very resinous ; resists a long time alternate wet and dry ; is elastic and easily worked. Generally used in house-building and in shipbuilding for masts, jib-booms, etc. Specific gravity 0.489.

5. *Kashinoki*.—Grows in clayey ground ; seems not to vegetate north of 40° N. L., best qualities in Satsuma and Totomi. To be found in large quantities but of inferior dimensions ; it is very porous, so that if blown at one end of a stick of 4 to 5 meters length, the air will be seen to escape at the other end ; by which porousness very easily split along its length. Resists badly alternate dampness and droughts ; very liable to destruction by sea worm ; tough, but not elastic ; not easily worked. Used in shipbuilding for rudders, pivots, etc. ; also used for water-mills, wheelworks, etc. ; only of very little use in house-building.* Specific gravity 0.779.

* Generally used as firewood.

6. *Keyaki*.—Grows in poor clay; spread throughout the country and of different dimensions; 35 to 40 m. in height, 3 to 3½ m. in circumference at 250 to 300 years of age. Its principal feature consists in a great number of small pores, $\frac{1}{5}$ to $\frac{1}{10}$ of a millimeter in diameter, and regularly divided between the annual cycles. Capable of resisting alternate wet and dry; very elastic, not much liable tol cracking; easily worked. In shipbuilding its principal use is for deckbeams, sleepers under engines, etc.; in housebuilding used for doors; a knotty grown wood, which is of a very fine appearance for furniture. Specific gravity: 0.609.

7. *Kusunoki*.—(Camphorwood). Grows in clay and never in sandy ground, specially in the provinces of Kishu, Idsu, Kai, Oomi, Busen and Chikusen; best qualities are grown in moist ground. The biggest trees are about 10 m. high aud 10 to 25 metres (?) in circumference; very large branches, from 4 to 4½ m. in circumference, usually cut for timber. The stem is generally hollow; some of them are to be found of 20 fathoms in circumference, with a hollow of 65 square meters and with a luxuriant crown. Does not resist alternate wet and dry weather well; under the ground not so much liable to destruction by worms as other kinds of wood. Very elastic. Used in shipbuilding for keel joists, lining of cabins, etc. No use in housebuilding, but generally used for boxes and furniture. Specific gravity: 0.529.

It must be remarked that the specific gravities were determined upon samples which Mr. Akamats furnished to the Royal Institution; but this specific gravity seems to vary within very wide limits. At least I myself determined the specific gravity of *keyaki*, *hinoki* and *sugi*, which were to be used in constructing the new Etai-bashi and I found for:

Keyaki	0.937.
Hinoki	0.448.
Sugi	0.549.

the first and last of which numbers differ, as will be seen pretty much from those given by Mr. Akamats.

Under water of course all these kinds of wood are very durable, if not everlasting, provided no seaworms are in the neighbourhood; *kashinoki* seems to be most liable to destruction by this insect.

Until of late I believe the Japanese used no preventive against this disease, but in the construction of the new Etai and Riogoku bridges they have taken to coppering, which, copper being comparatively cheap, I suppose will promise effective results.

As to the durability of wooden structures in Japanese waterworks, it is very difficult to compare it with that of works of a similar nature in Europe, as these latter would never be allowed to remain in use in such a bad and often dangerous state as is the case here. Much could be done by effectually tarring and painting and by maintaining this tarring and painting continually in a well-conditioned state.

But the principal thing to which attention should be given, is the use of well seasoned and dry wood. That the Japanese know its value I have seen many instances of last summer along the Tenriu-gawa, one of the chief outlets of timber from the interior, (the yearly export amounting to a money value of 400,000 *yen*). The villages along the lower part of this river are inhabited for the greatest part by wood-merchants, the sale-rooms of whose houses are constructed with the most beautiful pieces of timber, serving in this way at once as samples for visitors and buyers. One house I may mention in which the floor of the *tokonoma* consisted of one piece of *sugi* of 6 by 3 by 0.4 ft., while all the sliding-doors (of the ordinary dimensions) consisted of one single board; moreover the ceilings, linings of walls, etc., were ornamented with similar large planks. This house was not new and the fact of all its wood being without a single rent and looking as sound as if quite new, may well be taken as a proof that much care had been taken in drying it, which indeed was affirmed to me by the owner. A great

difficulty which foreign engineers experience in designing wooden structures in Japan, most certainly consists in nothing being known about the strength and stiffness of the timber or of its limit of elasticity. Experiments on a large scale to this purpose have, as far as I know, never been made, or at least published; although they are of an elaborate and rather expensive nature, it would certainly prove an economy to the Government, if one of its departments were to undertake them and publish the results.

At the adjourned meeting of the Society held at the Kaisei Gakko in Tôkio, on the 27th October, the Revd. Professor Syle having been elected to preside, Professor Ayrton read the minutes of the previous meeting which were approved.

The Chairman laid upon the table two packets of Japanese quicksilver presented to the Society by Mr. Erasmus Gower, one for the museum in Tôkio, the other for the museum in Yokohama. He stated also at the same time that Mr. Hatakeyama, the Director of the Kaiseigakko, had placed a room at the disposition of the Society to be specially appropriated to its uses as museum, &c., within the college.

After a few desultory remarks, the discussion of the paper of Dr. Geerts on Quicksilver in Japan was proceeded with.

Professor Atkinson remarked that the Society was very much indebted to Dr. Geerts for his interesting and valuable communication, and for his exertions in bringing into notice the metallurgical processes employed in Japan. His work was of the greatest interest, as it permitted a comparison to be made between the processes used in this country with those in use in other countries. In Europe, where mercury had been extracted from the earliest times, improvements had been made from time to time, commencing with the simplest of all possible apparatus, and gradually introducing more complicated arrangements. None of these processes, however, had given a satisfactory yield of metal; that arrangement which gave the best results was invented by Dr. Ure for the purpose of extracting the mercury from the poor ores in Rhenish Prussia. It consisted of a series of iron retorts, like those used in gas works, terminating at one side in an iron tube, which dipped into water, the condensed mercury being carefully collected. The cinnabar, or sulphide of mercury, the ore from which the metal is usually obtained, was mixed with quicklime, and the mixture heated in these retorts; mercury distilled over into the condenser, while the sulphur remained behind in combination with the lime. The resemblance between the Japanese process and Dr.

Ure's was striking. The Japanese used an iron pot, covered with a lid, into which was fitted a bent tube, the other end of which dipped under water. The ore was mixed with wood ashes, which no doubt played the same part as the quicklime. It was exceedingly interesting to observe that the Japanese process, or rather the Chinese, as it was introduced from China, resembled so nearly one of the best of the foreign methods. It was, however, to be regretted that Dr. Geerts had not mentioned what percentage of mercury was obtained from the ore, so that the relative efficiency of the condensers might have been ascertained.

Professor R. Smith called the attention of the members to the collection of Japanese plants in a dry state that was about to be sent to Europe by the Educational Department of the Government.

Mrs. Chaplin Ayrton then proceeded to read a portion of a paper upon Japanese woods, translated with additional notes by Lieut. Lindo, from the Transactions of the Royal Institution of Engineers of Holland from a paper by Rear-Admiral Akamatsu. The reading was interspersed with remarks from Mrs. Ayrton as to the characteristics of the trees and the uses to which the various kinds of woods were applied.

Mr. Aston said that the notice of this meeting given in the newspapers had hardly prepared him for some interesting features of it. The advertisement had led him to expect a "paper" on the Woods of Japan from Professor Smith; but he found that an unwritten lecture was given instead, and no notice was given to the Society of the interesting observations on Japanese woods with which Mrs. Ayrton had agreably surprised the meeting in connexion with Mr. Lindo's paper on that subject. Mr. Aston thought it was desirable that the Society should, as far as possible, be made acquainted beforehand with the business which was to come before it.

Dr. Antisell remarked upon the great interest of Mr. Lindo's paper, and also that of Mr. Smith's experiments on the strength of timber. The remarks of the reader of Mr. Lindo's paper, on the slender viability of the young *matzu* tree, and its inability to bear sunshine, reminded him that this was the true reason of the disappearance of forests from certain parts of Europe where they had abounded some centuries past, as in Denmark the prehistoric beech forests have given way to different species. Thirty years ago, when the mineral theory of Liebig was in full popularity, the reason assigned was the exhaustion of the soil of the elements appropriated by these trees; but it is more likely it was owing to some climatic conditions unfavourable to the growth of very young trees, like the peculiarity mentioned of the *matzu*. Something of this kind has been observed along the coasts of California. Formerly the pine trees grew down to the water's edge, giving a peculiar feature to the landscape, but since the establishment of saw-mills to convert the large trees into lumber, the ground has been considerably cleared and the young pines do not come up as abundantly as before, so that the landscape now looks as

if the pine tree had disappeared. With regard to the relative strength of Japanese and European timber of like dimensions, it is evident that Japanese timber must be weaker, at least that portion of timber which grows on this island where there are no heavy winter frosts. To make good timber there must be temporary arrests of growth by which the sap is drained out of the tubes and the fibres shrink together from the cold, while the new wood of next year, forming a ring round the old, prevents its future expansion and thus renders it more dense. The strength of timber (*ceteris paribus*) resolves itself into this formula,—how many wood fibres are in a square inch of cross section?—Those having most are of course strongest, and those will have most which are grown in countries where the growth is temporarily arrested, that is, in countries where winters are well marked.

Professor Perry then addressed the meeting, stating that Mr. De Boinville had placed in his hands a paper relative to the felling and seasoning of timber, which he begged to have read to the members present. In this it was stated that timber used to be felled only in June and July, but that since the greater demands for large timber had arisen the period was extended to September. But, as an exception, oak was felled in March. The wood is softer in summer, having the sap in full flow, and hence the choice of June and July to enable the wood-cutters to carry on their task with greater ease. The Japanese season their wood by immersing the newly felled tree (after being barked) in water for a longer or shorter period, from 30 to 70 days according to the use to which it is to be put. There is, however, an exception to this method of seasoning in case of *maki* (a species of pine) which is generally used under water. As regards the growth of timber, Mr. De Boinville's paper contained some interesting facts obtained by comparing the ages and sizes of the same trees in France and Japan. Pines growing in the Vosges valleys required eighty years to equal the size of Japanese pines of fifty years of age. And this rapid growth in Japan accounted for the comparative weakness of the timber. There was also a difference between the same wood grown in the valleys and on the mountain sides or on high land, the latter requiring more time to mature, but being closer of grain and consequently stronger.

Referring to Dr. Geertz' paper, Dr. Antisell observed that among the localities where cinnabar is found that of Tsushima had been omitted: it was there that this ore was first observed, and from there no doubt Klaproth obtained the specimens from which the first examination of the Japanese variety was made. The ores are not rich in Japan, but in a country where labor is so cheap a poor ore might be worked economically. Those of Almaden in Spain do not average more than 15 per cent. The various processes used at New Almaden, Cal. to obtain metallic mercury of pure quality were then reviewed, and attention called to the method of Violette which consisted in the use of superheated steam, which so far as known had been used with success.

ON THE WINDS AND CURRENTS OF JAPAN.

BY

CAPTAIN SCOTT.

Read before the Asiatic Society of Japan, on the 15th December, 1875.

The following remarks on the weather on the coast of Japan being noted from memory, an allowance must be made for any inaccuracies which may he observed, as it is rather difficult to remember such things sufficiently well to be altogether positive, but I think they will be on the whole pretty correct.

I may state that my experience extends from 1860 to 1870; in the autumn of which year my vessel was lost in Odawara Bay, during a typhoon that passed over here October 13th of that year.

In the Japan Sea, from the Straits of Korea to the head of the Gulf of Tartary, the winds prevail, from July until April from West to N. E., blowing the hardest between West and N.W. and easing always after it veers to the Northward. N.E. winds gener. lly bringing fine weather, the wind often blows steadily from that quarter for a week or more on a stretch, after which a change is likely to come on, by the wind hauling to the East and S. E. with rain, the breeze freshening as it inclines to the South, and often blowing very heavily between S.S.E. and S.W. although not often lasting more than twenty-four hours. The wind after hauling beyond S.W. brings clear weather and sets in for a gale from the W.N.W.,

which may continue for a day or two, then to follow the same course as before. I give this as the general run of winds for the nine months before noted, although there are occasional exceptions—when heavy squalls will come on (suddenly at times) from East and S.E. to S.W. and West—so rapidly as not to give a vessel time to shorten sail. It is advisable then to keep away before it, provided there is sufficient room to allow of that being done, otherwise sails are likely to be blown away, as has often happened to short-handed vessels.

During the months of April, May and June Southerly and South-westerly winds prevail, with generally fine pleasant weather, the strength of the wind seldom exceeding 5, and averaging 2 to 3, reckoning 10 a severe gale; but even in those months sudden squalls are met with, causing the wind to shift suddenly to the westward, although sufficient warning is generally given to prepare for their approach from the appearance of the sky during the day; or, if at night, by lightning in the quarter from which the wind is likely to come, and by the barometer, if closely watched. Southerly winds, as a rule, blow very light during the aforesaid three months, whereas in the other nine months of the year it often blows with extreme violence, and in April, May and June may be considered as a faint ending of the S. W. monsoon of the China Sea.

Local causes, however, sufficiently exist to make a great difference in the strength and direction of the wind, and in the kind of weather met with on the coast, as for instance all along from the Gotto Islands to Cape Chichakoff, a severe gale from the North will continue to blow for several days on a stretch, while it is blowing from W. N. W. in the Japan Sea and the Straits of Korea; and I have had rainy weather for two days coming along the West Coast, with the wind between N. N. W and N. N. E. while it is almost certain that at the same time it was blowing from E. S. E. on the Eastern Coast.

From my own experience, rainy winds are from East to S. W., and clear weather sets in with the wind from

West to N. E.; heavy gales often blowing at the same time and fine weather with the wind between North and East.

In the vicinity of Yokohama, when a typhoon comes on, the heaviest part of it is generally with the wind at South, but on the west coast the same will be found nearly harmless, probably owing to the mountains which intervene having shaken its strength. I have not at any time, felt any very severe storm in the Japan Sea, although I have felt the storm wave inside of the Straits of Korea, when a typhoon has been passing along the China Sea.

In the straits of Tsugar, which divide Nipon and Yesso, strong winds invariably blow right through in either direction, that is to say from W. N. W. or E. S. E., the land winds from either North or South, being in general light and baffling, and never to be depended on. Through these straits the current runs very strongly, sometimes at a rate little short of five miles an hour.

On the Pacific side of the Japan islands the wind takes pretty much the same course as it does in the Japan Sea, but squalls are more frequent and of greater violence, more especially in the vicinity of ports where the currents curve or meet; such as off Cape King, where the current striking the land, sets out to the E. S. E.; on the Nambu coast where the cold Arctic current meets the warm stream from the South; and between the Loo-choo islands, and Cape Idsu, where the direct flow of the current is interfered with by a cold stream off the land, and sometimes by winds from the S. E. during the summer months.

The quarter from which the squalls commence is not always the same, but I generally found them commencing to blow from E. S. E. to South, after a track of fine weather, although I have occasionally, met them coming out from N. W. on the northern coast, and in the Japan Sea; but warning of their approach is generally given by lightning, in that quarter from which the wind may be expected.

Fogs prevail in the Spring months during the season,

in which the winds are light, say April, May and June, but the Japan coast being pretty free of danger no great inconvenience is caused, as the fogs never last for any great length of time.

The rainy season may be said to extend from May till the end of July, but is earlier or later in different years.

Currents.

The "Kuro Siwo" or Japan stream, whether having its origin in the Gulf of Tonquin or in the Gulf of Siam, keeps on its course as far North as the Straits of La Pérouse in the Gulf of Tartary, and on the Pacific side of Japan up to 41° North latitude in the summer, and to 38° in the depth of winter.

This stream is generally strongest between the Southern end of Formosa, and the East coast of Japan as far as the islands at the entrance of the Gulf of Yedo, but its strength varies according as the S. W. or N. E. monsoon prevails.

During the S. W. monsoon, extending from May to September, the current has been known to run at the rate of nearly three miles per hour in the open sea, along the eastern coast of Japan, and sometimes at four miles per hour through the Straits of Tsugar, where I believe it runs stronger than in any part of its course.

My experience leads me to think that the current has its origin in the Gulf of Siam, because I have felt it running strongly to the northward along the coast of Luzon during the N.E. monsoon, whilst in the open sea a strong counter-current was setting to the southward, and it is never felt in the Formosa Channel.

The general run of this current is to the N.E. and premising that it commences at the South end of Formosa (the main stream) running through the Bashees, to the North of the Miacosima group, and thence through the the Loo Choo islands towards the entrance of the gulf of Yedo, it strikes the coast of Japan about Cape King, where it converges to the eastward, that is to say the strength of it runs off to the E.S.E. while a portion keeps on along the coast to the northward as far as the Nambu shore, where it is met by a cold current from the North, and is turned

off to the Eastward, and finally loses itself in the Pacific.

This is the main portion of the warm stream ; but after leaving the coast of Formosa, a portion of it runs more to the northward towards the Straits of Korea, through which it flows with considerable rapidity, (and generally stronger on the north side of the island of Quelpart than it does on its southern side) and keeping on its course to the northward through the Japan Sea, one portion of it passes through the Straits of Tsugar by Hakodadi, the other through the Strait of La Pérouse, and is finally lost in the Arctic Current which it meets—on entering the Pacific in the one instance, and amongst the Kurile islands in the other.

As regards the individuality of the Japanese stream, I think it is as closely defined as the Gulf Stream in the Atlantic, and having been in the habit of trying the temperature of it whilst at sea, five times during the twenty-four hours for several years, I may state that if I had not lost my memoranda a good chart of the stream could have been made with their assistance.

I am also of opinion that it is of a higher temperature than the Gulf Stream ; having found it as high as 87° in the strait of Korea, in July, (the surface water I mean), and I think, it is also of a more regular temperature ; the above temperature being nearly as high as it is generally found in the southern part of the China Sea.

In the Straits of Tsugar I have noted the temperature as high as 72° in the summer months and in La Pérouse Straits at 56°, and the difference between the cold water close to the shore and the warm is often as much as 12°

In the Japan Sea on getting to the northward towards the Coast of Manchuria, I have known the thermometer to drop 12° to 14° in less than an hour ; and have experienced the same thing off the Coast of Sendai, when it meets the Arctic stream from the North ; and it is here that sudden squalls may be expected, as I noted in my remarks about the winds.

I am aware that some persons think that the cold Arctic Current forces its way into the Japan Sea through

the Straits of Tsugar and La Pérouse, but I am inclined to differ from them. In the La Pérouse Straits there is a regular tide close to the shore, and I found the temperature of the water much the same with both ebb and flood. In the Straits of Tsugar the tides are scarcely perceptible unless in still weather, and with strong westerly winds the current extends from shore to shore between Cape Blount and O-o sima and invariably runs to the eastward.

I am inclined to think, that the Arctic Current on approaching the Nambu shore runs off to the eastward and is lost by mingling with the warm stream in the Pacific.

I certainly never felt the temperature to fall enough while near the Coast of Japan to cause me to think that the Arctic current was forcing itself through into the Japan Sea, and, as I have before said, being in the habit of testing the temperature of the surface water five times during each twenty-four hours, am pretty certain I should have detected any decrease in the temperature such as would have been shown between the warm and the cold stream.

In the Japan Sea, the influence of the warm stream is not so decided as it is on the Pacific side of the island, probably owing to its being confined by land on both sides, whereas it has the open sea on the Pacific Coast on one side.

It is certain that the weather on the Pacific Coast of Japan is much more variable than it is on the other side of the Island; and I am inclined to think that the difference is caused by the current alone, it not having so much to impede its course on the one side as it has on the other.

Finally, I think the warm stream has a great effect on the temperature of Yokohama, as residents can verify by noticing the difference between a northerly and a southerly wind, this being at least 15°; and I am of opinion that the climate of the western coast is much more regular than that of Yokohama.

ON THE TEMPERATURES OF THE JAPANESE WATERS.

BY

J. H. DUPEN, H. M. S. *Ringdove.*

Read before the Asiatic Society of Japan, on the 15th December, 1875.

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I quite agree with the statement and opinions of Captain Scott that the whole climate of Japan is regulated by the currents of the ocean. The warm stream from the South appears to run up the eastern shore and to turn off somewhere about Nambu. On the western side I think the southern current is turned off in the direction of Shanghai by the northern stream, which appears to flow down the West coast, keeping it cooler in summer than the eastern side. The Island of Yesso seems to be entirely affected by the cold stream, which doubtless accounts for the rigour of its winters. I am under the impression that a line drawn from East to West, across the sea of Japan in the latitude of Nagasaki, will show the points where the two currents meet, and North of which the warm current loses its effect. My opinions are merely derived from the tables on the other side and a study of *daily* changes in temperatures as noted in the engine-room register. With regard to force and direction of currents I can say nothing; it is not in my province and I have no means of ascertaining them.

The position of the ship daily may be judged approximately by the dates, and the fact that the average speed

is about 6 knots during these cruises, except in the Inland Sea where we steamed 10. The temperature of the Inland Sea is very uniform throughout. At Nagasaki in winter, with deck thermometer at 34°, I have seen clouds of vapour from the water which was 56°, but for this I have no doubt that Nagasaki would be nearly as cold as Hakodate.

September 1874.

A regular meeting of the Asiatic Society was held on Wednesday, the 15th December, 1875, at the Kaisei Gakko, Tokio.

The Rev. Dr. Veeder was called upon to take the Chair.

The Rev. Professor Syle moved: "That the meteorological instruments offered to the Society by the Meteorological Department in Washington some time ago be accepted."

Some discussion then arose with regard to the propriety of accepting the instuments, before the report of the Committee appointed by the Council to consider the matter had been given in. This Committee (consisting of His Excellency Sir H. S. Parkes, Dr. D. Murray, Rev. Dr. Brown, and His Excellency C. de Struve), having made no report, it was moved as an amendment by Dr. Antisell and seconded by Professor Grigsby "That the consideration of the subject should be deferred until the next meeting." This amendment was carried by the casting vote of the chair.

Objection was taken to the adjournment of the regular meetings as was done lately upon the authority of the Corresponding Secretary, who stated that, there being no paper to read, he had to adjourn the meeting. Dr. Antisell thought it was unsatisfactory to make such changes, and that it would be better to meet whether there were any paper to read or not.

The Rev. Professor Syle then entered upon the reading of Captain Scott's Paper on "The Winds and Currents of Japan," in the absence of the writer, prefacing the subject with a reference to the wrecks of the "Hermann." the "Relief" and the "Nil"—all which ships were lost from the effect of unknown or imperfectly understood currents on the coast of Japan. He also instanced the case of some Pelew Islanders having been drifted 1,000 miles to the coast of Formosa in sixty days by a supposed current.

Captain Scott's paper was then read, after which Dr. Antisell remarked that he thought the observations of Captain Scott and the remarks of the naval officer (Mr. Dupen) had considerable value, and it was very desirable that the Society should collect observations of the winds and currents of the western side of the Pacific Ocean. Too little attention had been directed to what is already known about the Kuro Siwa, and on that account he could not agree in all the statements of the papers. It is now well

ON THE TEMPERATURE OF JAPANESE WATER.

From.	To or At.	Between.				Temps.	Remarks.
Shanghai ...	Nagasaki ...	Dec.	29th/73 1874	Jany.	3rd/74	50° to 62°	Water of the Yangtze influenced by the weather, but sea outside not so affected; southern current takes effect.
Anchored ...	Nagasaki ...	Jany.	3rd	,,	20th	56°	Lower than the sea, due to cold surface water.
Nagasaki ...	Kobe	,,	20th	,,	26th	56° to 50°	Inland Sea lower in winter than the Japan Sea.
Anchored ...	Kobe	,,	26th	Feby.	18th	48° to 49°	Kobe colder than the Inland Sea water; generally surface water.
Kobe	Nagasaki ...	Feby.	18th	,,	21th	50°	Slight rise: showing that harbours feel the influence of climate, and are affected when seas are not.
Anchored ...	Nagasaki ...	,,	21st	March	8th	56° to 58°	Under the influence of spring weather.
Nagasaki ...	Kobe	March	8th	,,	10th	60° to 50°	Outside of Nagasaki, but falls directly we enter the Inland Sea.
Anchored ...	Kobe	,,	10th	April	5th	50° to 52°	Kobe is 4° higher than it was in February.
Kobe	Yokohama...	April	5th	,,	8th	58° to 60°	Showing the effect of the Southern current running up the E. shore.
At Yokohama	& Yokoska...	,,	6th	July	11th	54° to 78°	Arriving at Yoko. find water cooler than outside, but note the rise as the summer advances.
Yokohama ...	Kobe	July	11th	,,	14th	74° to 76°	At this season the eastern waters are cooler than the Gulf of Yedo.
Anchored ...	Kobe	,,	14th	,,	17th	76°	Kobe at this season is as warm as the outer waters.
Kobe	Nagasaki ...	,,	17th	,,	20th	72° to 85°	Inland Sea rather lower than Kobe; temperature rises rapidly as we near Nagasaki.
Anchored ...	Nagasaki ...	,,	20th	Aug.	6th	85° to 80°	Harbour much heated by the sun at this season.
Nagasaki ...	Vladivostock	Aug.	6th	,,	12th	80° to 68°	Steering towards China temp. falls rapidly to 68°, but rises to 75° as we enter the large bay in which Vladivostock is situated.
Anchored ...	Vladivostock	,,	12th	,,	20th	77°	Two degrees higher in habour.
Vladivostock	Hakodate ...	,,	20th	,,	24th	73° to 67°	As soon as we clear the bay the Northern current takes effect bringing temp. from 77° to 73°, and so on down to 67°, rising again to 74° as we near Hakodate.
Anchored ...	Hakodate ...	,,	24th	Sept.	8th	74°	Hakodate is not much higher than the outer waters.
Hakodate ...	Yokohama...	Sept.	8th	,,	12th	73° 68° 78°	Soon after leaving Hakodate we feel the effect of the North current and fall to 68° which continues till we are abreast of Nambu, when in an hour, while running about 7 miles, the temperature rises to 78° and continues so until we reach Yokohama, where it is 80° at this season.

known that this body of warm water, which passes North East of Japan, is not lost in the great mass of the Ocean, but keeps a distinct course N. E., as far as parallel 50 N. when, sending a very thin channel of water through Behring's Straits, the main body of warm water turns easterly, approaching the shores of North America, coasting along Sitka, Washington Ty~~r~~ Oregon and California as far south as Cape Mendocino, raising the mean temperature and modifying the flora of those lands. He did not agree with the paper in limiting the origin of this stream to the coasts of Siam and Cochin China. No doubt the Southern China Sea had its share in originating this current; but it was a lesser share; the main portion of the current being derived from the Pacific Ocean around and east of the large equatorial islands, and passing North, is split in half by meeting Formosa, one portion going west of that island through the Formosa channel and thence Northward through the Japan Sea to the Straits of Tsugaru and La Perouse, through each of which it sends a small stream Eastward to join the great body of water coming Northwards along the Eastern shores of Formosa and Japan. This body of water is of much greater dimensions than it is supposed: it is of great depth and several hundred miles wide in summer, off these shores; and although differing in temperature and rapidity of current, it can be scarcely considered inferior to the Atlantic Gulf Stream.

Dr Veeder said that, having resided for eleven years on the Pacific coast, he could bear testimony to the effects produced upon the climate of the coast of Oregon, California &c. by currents running in a southerly direction. The climate of places only eight or nine miles from the coast differed materially from that of the coast itself. He attributed this mildness of temperature along the thousand miles of coast to the influence of the Kuro Siwa; and as Great Britain enjoys a mild climate from the Gulf Stream, so California is similarly affected by the great Japan current.

The Meeting then separated.

NOTES TAKEN DURING A VISIT TO OKINAWA SHIMA—LOOCHOO ISLANDS.

BY

R. H. BRUNTON, Esq.

Read before the Asiatic Society of Japan, on the 19th January, 1876.

Among the first papers read before the Asiatic Society was one by Mr. E. Satow, of H. B. M. Legation, upon the Loochoo Islands. The following notes may be considered as affording a little supplementary information, which was procured during a couple of day's visit to these Islands.

We left Kagosima in the S.S. *Thabor*, on the evening of the 9th December, and proceeded so as to pass to the westward of the chain of islands which extends in a south-westerly direction from Cape Chichakoff (Satano-misaki) to the north end of Formosa—the Loochoo islands forming part of the chain. On the evening of the 10th we passed, at a distance of about thirty miles, Ôshima, which is one of the Loochooan group, and is inhabited by people of similar kindred, but which is under the authority of the Kagoshima *ken* and does not form a part of the territory of the King of Loochoo. It was on this island that a sugar refinery was erected by the Prince of Satsuma with the assistance of the Messrs. Glover of Nagasaki, in 1867. This did not prove sucessful financially and, I understand, the machinery has since

been removed to Ozaka. Oshima possesses an excellent harbour which is sheltered in every direction and the trade between it and Kagoshima, in certain seasons, is very considerable.

We arrived off Nafa on the afternoon of the 11th December. During the voyage we experienced N. W. winds of no great violence—and this wind continued with us more or less until our return. The monsoon whose direction is N. E. on the China coast, is therefore changed in direction in this locality.

Nafa is on the western shore of Okinawa Shima; it is a town of probably five or six thousand inhabitants, and is supposed to be the port for the capital of the island, which is situated about three miles inland. The distance from Kagoshima to Nafa by the track we came is about 400 miles. The harbour at Nafa can hardly be considered fit for vessels to make any extensive use of. There is only a very slight indentation in the coast line, which there runs about N. E. and S. W., and the only protection to vessels is afforded by coral reefs which partially surround a basin. Some of these come quite to the surface of the water and their position may generally be distinguished by the surf breaking on them; others, however, are at distances of 3 feet and 6 feet and 12 feet below the surface, and nothing is visible which marks the position of these latter. And, as they seem to exist at the entrances to the anchorage as well as in the anchorage itself they form a most formidable danger. The strong N. W. wind which blew during one day that the vessel lay at Nafa cut off all communication between the ship and the shore, and a heavy swell came rolling in to the anchorage which rendered our position a most uncomfortable and, to some extent, a precarious one. We knew that we were surrounded by perfectly precipitous coral reefs, some of which were within a few hundred yards of us, and had any fracture occurred to the moorings which held the ship as she plunged and heaved, we should, in a few minutes, in all probability, have been driven against one of these. In a creek on the southern side of

the town there is a depth of water of from 2 or 3 fathoms. Small steamers might find shelter here, and three or four large junks were lying in it at the time of our visit. But for vessels of over 300 or 400 tons, it is not available, and Nafa cannot in any way be considered suitable for a commercial port.

When we arrived at Nafa, the fact of our being in a country in which the people were very different from those whom we had just left, became at once apparent. Several boats came off to the ship, but instead of being the tidy-looking, swift, and picturesque craft which we are accustomed to in Japan, they were canoes, made out of one log of wood, and very similar in shape and appearance to those at Aden. They were propelled by two men, one in the bow and another in the stern, by means of paddles. The only other boats which we saw were square clumsy looking boyes which were also propelled by paddles. The sea-going junks, however, which make voyages to Foochow and Kagoshima are strongly constructed, and are of the same shape and build as the ordinary Chinese junk. They are decorated with an eye on each bow and by a red ball on a white ground on the stern. This, we were informed, however was merely a decoration, and in no way an emblem that the vessels were under Japanese colours.

The town of Nafa is built on a piece of level ground adjoining the sea coast, while the capital, Shinri, is built on a series of small hills. The latter is a straggling scattered town, and it would be very difficult to form any estimate of its population. From the summits of some of the hills good views can be obtained of the surrounding country, which appeared to be in the highest state of cultivation. And from its gentle undulations, with small streams winding through the valleys, its rich herbage and avenues of trees, it afforded a very close resemblance to some phases of English scenery.

The streets in the towns present a most desolate appearance. On each side of these is a blank stone wall of about 10 or 12 feet high, with openings in them here and there sufficiently wide to admit of access to the houses

which are behind. Every house is surrounded by a wall, and from the street they convey the impression of being prisons rather than ordinary dwellings.

The streets are also paved with blocks of stone. These have very irregular surfaces which render walking over them most uncomfortable. It was observed that in front of the dwellings of those of high station, or in front of temples and other places of importance, that the roads were laid perfectly smooth, with broken stones bound by clay in much the same system as is used on macadamised roads. The people therefore, are perfectly aware of what smooth roads are, and it is to be regretted that they did not more largely adopt these. The high road from Nafa to Shiuri is 30 or 40 feet wide and is lined with trees on each side. It is laid throughout its entire width and for the whole length of the road with these blocks of stone. This represents an immense amount of labour and, while not convenient for pedestrians, it has the advantage of being everlasting.

The houses of the well-to-do classes are situated in a yard which is surrounded by a wall ten feet high, as has been already mentioned. They are similar to the ordinary Japanese houses with raised floors laid with mats, and sliding screens of paper. They are built of wood and present no peculiar differences from the Japanese style of construction. The roofs are laid with tiles, which, however, are quite different in shape to the Japanese tiles. Over the joint between two concave tiles, a convex one is laid, and these are all semi-circular in cross section. The tiles are made at Nafa and are red in colour. They appeared of good quality. The houses of the poorer classes are of a very primitive character. The roof is covered by a thick thatch, and is supported by four corner uprights about five feet high. The walls consist of sheets of a species of netting made of small bamboo, which contain between them a thickness of about six inches of straw. This encloses the whole sides of the house, a width of about two feet being left in one side as an entrance. There is no flooring in the houses of any description, and there is

generally laid over the mud inside a mat on which the inmates lie or sit. We found that a pig was generally attached to each of these houses and that pork is very largely consumed by the inhabitants of the island. In each house also there is a weaving loom, and the dresses of the people are all woven by themselves in their own houses.

There are no shops in Loochoo, and when anything is required to be purchased it may be brought by the dealer to the house of the buyer. There is, however, in each town a market place where various commodities are exposed for sale. These principally consist of the general food of the people, which is sweet potatoes, pork and a few fish. There were large quantities of Japanese tea which we were told the Loochooans were very fond of, and which they drank after the fashion of the Japanese. Satsuma tobacco was also observed in some quantity, and several bundles of English cotton twist. The market stalls are all presided over by women, who are evidently entrusted with the commercial operations of the island. The only money in use is copper cash, but the natives did not refuse the silver of some of our party who purchased a few things. Some of the women in the market were young, but the great proportion were elderly. The practice of tatooing the backs of the hands of the women was to be seen here; the younger ones had a few marks only, while the hands of the elderly ones were covered down to the nails. That the Loochooan married women are kept in such seclusion as is related by Mr. Satow, namely, that they are not allowed to have any communication whatever with the small portion of the outer world, may be true of the higher classes. We had no opportunity of testing this, but that it cannot be correct as regards the lower classes there can be little doubt. We observed numbers of women of all ages engaged in all manner of occupations, going about and conversing with as much freedom and self-assurance as is customary in any part of the world, and it is only reasonable to suppose some of these must have been married.

Loochoo has been visited by various foreign vessels at different periods. H.M. ships *Alceste* and *Lyra*, then on a cruise in Chinese waters, came to Nafa in the year 1815. And Captain Basil Hall has described the Island in his narrative of the voyage of these vessels. They remained at Nafa for some months and were refitted there, and the officers and crews experienced the greatest courtesy and civility from the natives. Commodore Perry also called here on his way to Japan with the U.S. squadron, but his experiences of the Loochooans were not so favourable as those of Captain Basil Hall.

A little distance out of Nafa under some fine old fir trees are quite a number of graves of Europeans. Each grave has placed over it a block of stone work, about the same size as an ordinary grave and three feet high. On the top of this there are, on most of the graves, stones let into the masonry, which have inscriptions cut on them. From these we observed that two or three Catholic priests had been buried there, as also four men who had belonged to the American squadron. One inscription was over the grave of an English sailor of the *Alceste*, and it bore testimony to the good feeling existing between the English and the inhabitants at that time. It mentioned that the memorial had been erected by the "King and inhabitants of this most hospitable island."

The people are of a timid and most inoffensive nature, and all our experiences of them shew them to be kindly disposed to strangers. Their treatment of two survivors from the wreck of an English brig which came ashore on the island some years ago, was so considerate and so highly appreciated by the home authorities, that a gun vessel was despatched to offer the thanks of the English Government, and to present to the King a gold watch in recognition of the kindness shewn to them by him and his people.

On the sides of most of the small hills in the neighbourhood of Nafa are the tombs of the inhabitants. They are built of stone into the sides of the hills. Their top re-

sembles a horse-shoe in shape, and in front there is the opening into the interior which is built and cemented up so as to be air-tight. The roof is made of plaster and is flat, and the appearance of a number of these tombs on the sides of the different hills has a very picturesque effect. The method of burial is to leave the corpse in the tomb for about three years until it is entirely decayed, the tomb is then opened, the bones are collected and kept in an urn as a relic by the family. While walking in the neighbourhood of the tombs we observed one open. A temporary mat shed was erected in front of it and sounds of the most violent grief proceeded from the interior. This, we understood, was on the occasion of the re-opening of the tomb for dis-interment, when the relatives meet to witness the last rite performed upon the remains of the deceased. Mr. Satow mentions that this ceremony had been discontinued and that the people are buried in the same way as Japanese are; but I have reasons for thinking that this is only partially true, and that it is still adhered to by certain classes of the population.

There is abundant evidence that the whole island of Okusawa is of coral formation, and it, in all probability, affords an interesting example of a coral island which has been, since the formation of the coral, subjected to volcanic upheaval. On a hill about two hundred feet above the level of the sea the exposed rock was distinctly of coral and, in many places further inshore, coral was observed. The stone used in the buildings, walls, and also in paving the roads was also undoubtedly coral, but it had, of course, lost to a great extent its characteristic appearance by wear and exposure. The whole country is low and undulating, no hill being above 400 or 500 feet high, so that the upheaval to which it has probably been subjected has not been of an extremely violent nature. Coral reefs rising to about the surface of the water surround it on every side. These generally enclose a central space of deep water. The passage through these at Nafa, as is customary in other coral islands, is opposite the mouth of a fresh water stream. The island is sub-

jected to frequent shocks of earthquake, showing further that it is not yet far removed from volcanic action.

The climate is one which is of a sufficiently genial character to allow the vegetation to be green throughout the whole year. In the winter months some cold days are experienced, but snow or ice is unknown. The thermometer, during our stay in the month of December, was as high as 73°Fah. in the shade, and the sun was sufficiently powerful to necessitate our return to thinner apparel, sun-helmets and umbrellas.

The product which we observed as chiefly cultivated was the sweet potato. It is the principal food of the people, patches of paddy land were seen here and there, but they were not of any great extent. The rice is grown at various seasons of the year as it suits the convenience of the farmers. We saw some which had just been planted and which was expected to be reaped in March or April. The climate will admit of two crops being produced in the year, but the people, with sensible prudence, do not tax the productive properties of the land to so great an extent. Many groves of sugar-cane were observed. Oranges of a peculiar aromatic flavour grow on the island, but not in large quantities, and fruit of any kind appears scarce. The sago palm is cultivated in large quantities, and the sides of all the hills which are not otherwise occupied are covered with it. The whole island is in the highest state of cultivation, and in this respect will bear a favorable comparison with any part of Japan. The farming implements in use seemed to be precisely similar to those used in Japan.

There are many ponies on the island. They are from 10 to 10½ hands high and are well-shaped little animals. Some of our party who rode on them gave excellent accounts of their spirit and paces. They resemble the Manila breed of pony, or may possibly be a cross between it and the China breed.

A few cocoanut trees were seen but they do not bear fruit. Small quantities of tea and tobacco are also grown.

The trees on the island are all of small size, and wood is not plentiful. A few teak trees were seen, but the natives do not consider that they produce a valuable timber and consequently pay them no attention. From our own observation the wood in them would be small and full of knots. A hard timber named *Kômon*, and a soft wood named *Fuchitsuba*, are grown on the island and were observed in the temples and other erections. But a great part of the wood in use is the ordinary Japanese wood, which is imported from Kagoshima.

Owing to the scarcity of wood, stone has entered much more extensively into the building operations of the people than it has in Japan. The execution of the mason-work is also infinitely superior to anything to be seen in Japan. The Loochooans seemed to have grasped the principle of giving strength to mason-work by friction between the beds of adjacent stones. The joints are therefore made with truth, and although the stones are generally of the most diverse shapes, they fit into each other with perfect accuracy, unlike Japanese masonry, the stones in which are only kept in place by a bearing on each other of a few inches wide on their outer edge. The walls which surround the dwellings and which line the streets are all built in this way. The material in them is small, and in a few cases we observed that lime-mortar had been used in the joints.

All the bridges, on the roads, which we observed were built of stone. The openings in them are spanned by means of arches in the form of an ellipse. So far as the eye can judge they are almost perfectly elliptical. This form of arch is also to be seen over all gateways and other openings. There are also a few arches of the form of a segment of a circle, but the elliptical arch is by far the most common. Some of these are of exceedingly small rise and are ingeniously constructed. They are however faulty in so far that the arch stones are placed lengthways along the entrados of the arch, instead of the joints radiating from the centre. They are therefore but ill-calculated to bear the strains which come upon them.

The bridges have well-constructed piers and abutments and are furnished with stone parapets. The insides of these are ornamented with elaborate carvings and designs, which are chiefly of Chinese origin. The Loochooans admit having received their notions of building from China, and those familiar with that country will probably see great resemblances to Chinese erections in all that exists in Loochoo; but there are also, without doubt, evidences of some departure from Chinese methods and of original ideas on the part of these islanders.

The castle which is the residence of the King is situated in about the centre of Shinri and on an eminence about 500 feet above the level of the sea. The dwellings in which the king resides, are placed near the summit of the eminence. They are of the ordinary type of wooden buildings and are of considerable extent. They are built in a square, enclosing a court about seventy yards wide. This court is laid out in paths with different coloured tiles. Opposite the entrance is the largest building, which was shut up at the time of our visit—on the left and right being smaller buildings, which are used as the residences of the court officials, as reception chambers, and for other purposes. Surrounding these buildings, but at lower elevations, on the sides of the hill, are very extensive revêtment walls, some of which are 60 or 80 feet high and 14 or 15 feet thick. These walls, which must sustain an enormous pressure from the earth behind them are built in plan, in the form of a series of inverted arches. This seems an ingenious and excellent expedient for assisting the strength of such walls, and a principle something similar to it is adopted in large retaining walls in Europe. The pointed part of the wall, from which two arches spring, is ornamented by a peculiar and graceful curve. Cactus in profusion grows along the tops of the walls and they are covered on the outside with various creepers. To enter the castle it is necessary to pass through three gateways of very heavy mason-work, the openings through which are spanned by elliptical arches. The castle cannot be called

fortified, though its position and the existence of the high walls already mentioned would render it safe against capture except from an attack furnished with modern appliances. The object in constructing it has no doubt been to make it a stronghold capable of resisting any enemy known to the people. The king seems to take but little active part in the Government of the country and had not been visible to any stranger for some years.

The country altogether presents a strange admixture of Chinese with Japanese ways and customs. The inscriptions which are to be seen on the various monumental stones placed in the streets are written in Chinese. Many are quotations from Confucius and other Chinese classics, while others go so far as to represent the country as part of China. The principles of building have been partly borrowed from China. The tombs and manner of burial are to some extent after the Chinese fashion, and the general appearance of the towns gives evidence of the existence of a close intimacy with China. But the language on the other hand is Japanese. It is not precisely similar to the Japanese now spoken, but it is believed to be as nearly as possible similar to the language spoken some centuries ago, many words of which have become obsolete. While a great part of what was said by the Loochooans was understood by the Japanese, many words used by them were recognized as belonging to the old Japanese vernacular but which are now never heard. The more frequent intercourse with Japan has led to a familiarity with Japanese ways and the use of Japanese produce.

There were no Chinese on the island, and we heard of only one Japanese merchant who was resident there. There are three or four Japanese officials living at Nafa, who have been probably sent there for the purposes of the Government.

A tax of 8,200 *koku* of rice is levied by the Japanese government from the Loochooans. It is paid in sugar, that being the most valuable produce of the island. Certain articles are also sent to China each year, but these consist

merely of complimentary offerings and small presents. Communication is kept up between Loochoo and Foochow by means of large junks.

The island is between four and five hundred square miles in area, and it is said to have a population of 150,000. This is at the rate of three hundred to the square mile, a thickness of population so great as to be hardly conceivable.

The people are burdened with the maintenance of a large class of idlers who like the *Samurai* in Japan live upon hereditary privileges granted them by the government. These men are called *Daimios* and may be seen lounging about in every street. The lower classes are an industrious, docile, timid but extremely civil set of people. Their education is confined to Chinese, and only one book of Chinese classics is taught in the schools or, in fact, is known among them. They have little or no communication with the outside world. They produce on the island what is sufficient for their own wants and would probably be best satisfied in being left alone. But this is not to be their fate. The Japanese Government have taken over the active control of the country. It has been formed into a *Han*. A Mitsu Bishi mail steamer now visits it once every alternate month, and the Loochooans have probably experienced the last of that quiet and peaceful retirement which the geographical position of their country has heretofore afforded them, and for which their natures seem so well adapted.

ON THE ARROW POISON IN USE AMONG THE AINOS OF YEZO.

BY

STUART ELDRIDGE, Esq. M.D.

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The study of poisons has revealed the somewhat singular fact that certain of these deleterious agents produce a lethal effect only when introduced directly in the blood, being nearly or totally harmless when taken by the stomach.

Of this class of poisons snake venom may be taken as the type, for it has long been indisputably proved that while an infinitesimal quantity of serpent venom when injected in the blood or in any way placed beneath the skin will speedily be fatal, a large quantity may be swallowed without inconvenience. It is chiefly poisons of this class which are at present used for the preparation of poisoned weapons by the various savage tribes employing such means of offence.

Poisoned weapons are generally missiles, such as throwing spears or arrows, and the wide geographical range of their use may be inferred from the following brief mention of some of the best known instances of their employment.

The natives of Java, Borneo and Celebes make use of a poison extracted from the juice of the Upas tree, two species of the Upas being employed U. antiar, and U. tiute.

The poison consists essentially of the inspissated sap of these plants, that obtained from U. tiute being the most active. The action of these poisons has been investigated by Rumphius,* Leschenault,† Magendie, Delille, Brodie,‡ Horsfield,‖ Pelletier and Caventou,§ Mulder,¶ Kölliker* and Hammond.†

The Bushmen of South Africa employ two kinds of Arrow poisons. That which is in common use for the chase is a mixture of snake venom with the juice of the root of a poisonous Amaryllis (Haemanthus Toxicaria), while the second, which is in especial favor for war, is derived from a larva known as the N'gwaa or K'aa, which appears to be closely allied in structure and properties to the poisonous potato bug of Colorado (Doryphora Decemlineata). For the small amount of information which we possess on the subject of these African poisons we are chiefly indebted to Doctor Livingstone and Mr. Baines.

The Indians, at least some of the tribes, who range over the great plains of North America, make use of an arrow poison prepared by exciting the rattlesnake (Crotalus) to bestow its venom repeatedly upon a piece of raw liver. This liver is then buried until decomposition has taken place when it is smeared upon the arrows. The effects of this poison, like those of the bite of the reptile from which it is derived, appear to be neither uniform nor certainly fatal, but the subject still lacks investigation.

By far the best known and most interesting of the arrow poisons in use is the *curare* or *woorari* of the tribes about the Amazon and Orinoco. Many varieties of this poison are known, such as *corroval*, *vao*, and *ticunas*, but all appear to be closely related both in composition and effects. *Woorari* of the Amazon may be taken as the type of the class; the essential elements of this are the

* Herbarium Amboinense, tome II. lib. III p.263.
† Annales Museum d'Historie Naturelle, tome XVI, 1816. p.459.
‡ Philosophical Transactions, part I, 1811. p.198.
‖ Thompson's Annals of Philosophy vol. IX p.202. 265.
§ Annales de Chimie et de Physique, tome XXVI, p.44.
¶ Traite de Chimie de Berzelius, tome III., p. 869.
* Verhandlungen der Würtzburger, Phys. Med. Gesellschaft, Band VIII., 1857.
† Physiological Memoirs, 1863, p. 271.

juice of a species of Strychnos, snake venom and the crushed bodies of several species of poisonous ants and spiders.

From the fact that *woorari* produces certain very interesting physiological phenomena, its effects have been more thoroughly studied than those of either of the before mentioned poison. To enumerate all who have investigated this subject would be tedious and beyond the purpose of this paper. I will instance Boussingault, ‡ Pelletier, || Bernard, § Cogswell, ¶ Virchow, * Brainard, † Hammond ‡ and Du Cazal.||

The Goorkhas and other tribes inhabiting the flanks of the Himalayas make use of the root of the Aconitum ferox for poisoning their weapons. The prepared poison is known as *Bikh* or *Bish*, and its action as described appears to be identical with that of the subject of this paper.

Pereira, as quoted by Wallich, (Plantæ Asiaticæ Rariores, Vol. 1, p. 35, Tab. 41) gives the following experiments upon this poison.

"One grain of the alcoholic extract introduced into the peritoneal cavity of a rabbit began to produce its effects in two minutes; death took place in nine minutes and a-half. In a second experiment of a similar kind, the effects commenced in two minutes and a-half, and death was produced in eleven minutes. Two grains introduced into the jugular vein of a good-sized, strong dog produced convulsions in one minute, and death in three minutes. One grain introduced into the cellular tissue of the back of a rabbit began to affect the system at the end of six minutes, and produced death in fifteen minutes. A rabbit was made to swallow three grains of the extract; no effect was produced except that the animal continued chewing for several hours, as if ruminating, and which probably arose

‡ Ann. de Chimie et de Physique, tome XXXIX, 1828, p. 24.
|| Ib, tome XL, p. 213.
§ Comptes Rendus, tome XXXI, 1850, p. 534.
¶ Lancet, March 3rd 1855.
* Reisen in Britisch Guiana, Schomburgk, Band I, s. 456, note.
† Comptes Rendus, tome XXXVIII, 1854, p. 411.
‡ Physiological memoirs 1863, p. 190.
|| Archives Gen. Med. 1869 p. 328.

from the local action of the poison on the mouth and throat." The effects were (as detailed) tried in several ways, and in every case, except that in which the poison was given by the mouth, the effects were very similar, "namely, difficulty of breathing, weakness, subsequent paralysis, and death, apparently from asphyxia."

The root of an allied species, Aconitum Japonicum, is said to be used in Northern China as an arrow poison,§ but I have been unable to find any details in reference to its preparation or effects.

All these poisons produce their effect much more quickly and certainly when inoculated than when ingested, while some of them are absolutely harmless when aken into the stomach. The list of weapon poisonst might be much extended, but enough have been noticed to serve for purposes of comparison.

Now the intention of poisoned weapons will be best subserved by the use of poisons which act in such a manner as quickly to incapacitate the wounded man or animal for resistance or flight, and it is remarkable that all the known weapon poisons, with, perhaps, the exception of the N'gwaa of the Bushmen, produce among their earliest effects a paralysis of voluntary motion. The *woorari* possesses this power in an especial degree. We shall see further on that the arrow poison of the Ainos, is no exception to this general rule.

Another important requisite when weapon poisons are employed for purposes of the chase is that the poison shall not render the flesh of animals slain by it unfit for consumption as food. The Aino arrow poison does not fully meet this requirement, as we shall see hereafter, and in this respect differs from most other agents of its kind.

I regret that my knowledge of the derivation and mode of preparation of the arrow poison of the Ainos is as yet incomplete. Savage tribes invariably surround the preparation of medicinal or poisonous agents by mystery and superstition. The secret methods employed are known

§ Pharmaceutical Journal and Transactions, November, 1861, p. 263.

to but few of the tribe and the knowledge is generally hereditary. Although the existence and chief properties of the *woorari* poison have been more or less familiar to Europeans since the time of Raleigh, its exact composition and mode of preparation is still but uncertainly known. It is therefore not strange that definite information in regard to the Aino poison should still be wanting. The following statements, are however undoubtedly correct. The active ingredient of the Aino poison is derived from the roots of one or more species of Aconitum. The dried and imperfect specimens of the plant which I have seen appear to be A. ferox and A. Japonicum, known as among the most poisonous species. The root is prepared by maceration and pounding till it forms a pulp: this is mixed with other ingredients which I have been unable to identify, but which are probably inert, and the resulting mass is buried for a time in the earth. On removal from the earth, the poison appears as a stiff dark reddish-brown paste through which fragments of woody fibre are distributed. The poison when applied to the arrow, is mixed with a certain proportion of animal fat, an addition which would seem likely to render it less efficient, as the fatty matter would cause it to be less soluble in the blood. The poison is applied to the arrow in considerable quantity, such arrows as I have seen being charged with about ten grains each.

The arrows used are constructed in three parts. The point, or head, is either of bone or bamboo; when of the latter it is so cut that the hard silicious cortex of the cane forms the edge and point. The head is flattened upon one side and rounded upon the other. This head, of about an inch and one-half in length is slightly fastened by a lashing of bark to a fusiform piece of bone or deer-horn of about four inches in length; this bone or horn is again lashed by strips of bark to a shaft of wood or bamboo of about thirteen inches long, the butt of which is furnished with a triple feather.

It is on the flattened surface of the arrow-head that the poison is applied by moulding it into a smooth, rounded

elevation, having its long axis parallel with that of the arrow, (see drawing.) The Ainos employ their poisoned arrows chiefly for the destruction of the bear, an animal abounding in Yezo and attaining there a large size. A short and by no means powerful bow, furnished with a poisoned arrow, is adjusted in such a way as to command one of the usual run-ways of the animal to be taken. By a simple mechanism the bow is so arranged that on striking a cord which is stretched across the path, the detent is liberated and the arrow inflicts a slight wound. More than a slight wound the weakness and rudeness of the apparatus render almost impossible. It is probable, however, that the slight lashings of the arrow head frequently give way, allowing the poison-charged portion of the weapon to remain in the wound. The Ainos assert that after having been wounded the bear is always found dead within a very short distance. These set bows are so common in some parts of the forest of Yezo as to render travel rather dangerous.

As I have been able to obtain but a very small quantity of the poison, I have made but few experiments as to its composition and physiological action.

The chemical examination was undertaken under the justifiable suspicion that the active principle of the poison, is that usual in plants of the genus from which it is derived, namely, aconitine. Fifteen grains of the crude poison treated by boiling alcohol, ammonia, ether, and sulphuric acid, yielded 8/10 of a grain of a yellowish-white, amorphous material, a portion of which was dissolved in water acidulated with hydrochloric acid, and tested as follows.

With solution of caustic potass, a dirty white flocculent precipitate, insoluble in excess of the reagent but soluble in acetic acid.

With solution of chloride of gold, a yellow amorphous precipitate, sparingly soluble in hydrochloric acid.

With double solution of iodine and iodide of potassium, a red-brown amorphous precipitate, changed by addition of a solution of caustic potass into a white amorphous mass.

Now all of these tests are in themselves fallible, as

certain other alkaloids behave in exactly the same manner, there remained the physiological test as a confirmation. When applied to the tongue, aconitine, even in very minute quantity, produces an acrid taste, immediately followed by a peculiar sense of tingling and numbness. The extracted material before-mentioned gave this sensation. I feel justified, therefore, in believing that the active principle of the poison is aconitine.

Five experiments were made to determine the physiological action of the poison.

EXPERIMENT I.

A medium-sized dog of the larger Japanese breed received beneath the skin of the fore-leg ½ grains of the poison, rubbed up with a small quantity of glycerine. In two minutes the animal seemed to experience uneasy sensations in the region of the inoculation, while both pulse and respiration diminished in frequency one third. In five minutes there was unsteadiness of gait and almost total loss of ordinary sensation, as shown by the insensibility of the animal to pricking or pinching; pulse and respiration still less frequent than before. In seven minutes the animal fell over in a slight convulsion, respiration and pulse irregular as well as slow. After remaining in the recumbent posture for ten minutes, during which time there was slow improvement in pulse and respiration with gradual return of sensibility of the skin, the dog rose, moving stiffly and awkwardly, but gradually recovered, the following day being as well as usual, save a slight irritation about the wound by which the poison was inserted.

EXPERIMENT II.

A large dog of Japanese breed received beneath the skin of the foreleg one and one-half grain of the poison mixed, as before, with glycerine. He was then allowed to go, but had run a distance of but about two hundred feet when his legs appeared to give way, and he fell over convulsed, breathing slowly, laboriously and irregularly, motion of heart slow and almost imperceptible; these

symptoms gradually becoming more marked until, in five minutes from the reception of the poison, the dog was dead.

EXPERIMENT III.

A dog similar to that which was the subject of the second experiment received beneath the skin of the abdomen two grains of the poison mixed with glycerine. In two minutes the dog fell over exhibiting the same phenomena as to pulse and respiration as did the two preceding animals, and in four minutes and a half from the reception of the poison the animal was dead.

EXPERIMENT IV.

A dog similar to those before employed for experiment, received by the stomach, together with a small quantity of rice, two grains of the poison. In ten minutes he seemed uneasy, and the pulse and respiration became for a time a trifle slower than normal; no further inconvenience appeared to be experienced by the animal.

EXPERIMENT V.

To the same dog a few days later, five grains of the poison togther with a little rice, were administered by the stomach. In six minutes the dog whined and laid down, the pulse and respiration remaining unaffected till the expiration of fifteen minutes, when they became slightly slower than normal. In thirty minutes the dog had a convulsion in which he died.

The effects of the poison as shown by the foregoing experiments quite agree with those produced by the Himalayan poison examined by Pereira, as well as with those known to be produced by the official preparations of aconite when similarly employed. And it seems probable therefore that the Aino poison is practically identical with that used in Northern India and China.

From the comparatively large quantity of the Aino poison which was found necessary to produce fatal effects, I am induced to think that it is much less virulent than most other poisons employed for like purposes. Nevertheless, when used in quantities as large as those employ-

ed by the Ainos, it is quite competent to produce the results which they claim for it.

That the Ainos are able to eat the flesh of animals poisoned in the manner described is probably simply due to the fact, that in any single part of the animal's body the amount of poison is insufficient to produce perceptible effects upon the individual eating it. Beside which, the hunter invariably takes the precaution of cutting away a considerable quantity of the flesh about the wound in which the poison was received.

Such of the Ainos as I have questioned upon the subject, state that they know of no antidote to the effects of the poison, and that, when accidentally or intentionally wounded by a poisoned weapon, the only safety is instant and thorough excision of the wounded part.

A General Meeting of the above Society was held in the Grand Hotel on Wednesday, the 19th January. The chair was taken by the President, the Rev. S. R. Brown, D.D.

The minutes of the last meeting were read and confirmed, and the following new members announced :—Messrs. A. Hamao, F. M. Jonas, Geo. B. Williams, Gregory, J. Perry, H. S. Munroe, N. Wakayama, Rev. W. E. Parsons, and Dr. H. Faulds.

Mr. Henderson then proceeded to read a paper prepared by R. H. Brunton, Esq. entitled "Notes taken during a visit to the Loochoo Islands."

Dr. Brown congratulated the members of the Society upon the opportunity that had been give them to listen to Mr. Brunton's paper. He said they had before been favoured with a paper on the Loochoo Islands by Mr. Satow, which deservedly attracted attention on account of the limited sources of information within the reach of foreigners respecting those islands and their inhabitants. The paper just read was a valuable supplement to Mr. Satow's, Mr. Brunton's notes being those of an intelligent observer taken on the spot. It was not strange that in some points the views of Mr. Brunton should differ from those of his predecessor. Navigators of earlier times had given to the world but meagre and inaccurate accounts of those islands. Mr. Satow's opinion that the language of the Loochooans differs little from Japanese, seems to be confirmed by Mr. Brunton, with the remarkable addition that the dialect spoken there was spoken in Japan some centuries ago. It is an interesting question how this fact is to be accounted for, and its further investigation might furnish an important link

in the history of linguistic changes in the language of Japan. If it be true that there are no books written in Japanese in the Loochoo islands, but only in Chinese, this fact in any other country except Japan and its outlying dependencies would be considered an anomalous one, for, among the Japanese as well as those islanders, there has been, and now is, a predominant disposition to favor a mongrel exotic literature rather than to improve the vernacular and make it the language of books. Those islands which have been supposed by many to be of volcanic origin, are now found to be of a coraline formation, by some force lifted out of the sea. And thus we are gradually coming to a more accurate knowledge of that hitherto secluded portion of the Pacific islands.

Dr. Eldridge then read his paper on "The Arrow Poison of the Ainos."

On its conclusion Dr. Brown said, he was sure that the Society appreciated its obligations to Dr. Eldridge, its author, for it treated of a subject which probably no one else had been able to investigate and therefore was refreshing by its very novelty, and gave a pleasing variety to the Society's procedings. He regretted that he was not able to offer any remarks on the subject, so entirely aside from his own line of study, while it was important as a contribution to our information respecting an aboriginal race that is fast disappearing before the advances of a stronger one. He hoped the professional gentlemen present would favour the society with remarks on the topic.

After a few remarks from Dr. Hepburn, Sir Harry Parkes supported the President's opinion of the value of Dr. Eldridge's paper, which possessed much novelty and interest, and was a most welcome contribution to the Society's proceedings. He also commended the industry of Mr. Brunton in collecting during a brief visit of only two days so much information respecting the Loochoo Islanders. This little country and its people presented a most interesting study in many respects. Their language, customs and mode of Government were deserving of close research, and it would be important to ascertain beyond doubt, whether, as was alleged, they had no native literature, but were wholly dependent on that of China. While their civilization partook strongly of a Chinese type, the race was doubtless identical with the Japanese people and their language was a dialect of that of Japan. On this point he was able to give the meeting the opinion of Mr. Aston, which he had kindly furnished in the following note :

The language of Loochoo is plainly nothing more than a dialect of Japanese. It is, however, a very strongly marked one, and the differences are certainly not less than those between Lowland Scottish and English. Without some little practice, the services of an interpreter are very acceptable even to the Japanese themselves.

The following specimen of Loochooan will give some idea of the extent to which it differs from Japanese. It is copied from an

inscription in front of a temple dedicated to the worship of the former kings of Loochoo, and was the only example of written Loochooan seen during a stay of two days.

Anji mo gesu mo koma ni te oreru beshi. Anji is the name of an office, here put generally for all officials, ; *gesu* is Japanese, and means 'vulgar'; *koma* is Loochooan for *koko*, here ; *oreru* is Loochooan for *oriru*, to get down. The sentence means 'Both officials and common people must dismount at this place.'

Except *are*, he or it, the pronouns in ordinary use differ from the present Japanese pronouns. The words for 'you' are *onjo*, *i.e.* honourable place ; *na*, a word for you, common in the old Japanese poetry but now obsolete for hundreds of years, and *ya*. 'I' is *wan*, evidently a form of the Japanese *ware*.

These are not the only words obsolete in Japan which are still in Loochoo. Japan itself is called by them *Yamato*.

Both native and Chinese words present many differences with Japanese in the vowels with which they are pronounced. *Kiseru*, a pipe for instance, in Loochooan *kishiri* ; *hitotsŭ*, one, is *fŭtĕchi* ; *futetsu*, two, is *futachi* ; *nijiu*, twenty, is *nijō*.

A letter change which is not easily reconciled with the laws of letter change known in European languages is the substitution in Loochooan in some words of *ch* where the Japanese word has *k*. In this way *hachi maki* has become in Loochooan *hachi machi*. The word Loochoo itself is an instance of this change, *Loochoo* being the native form, *Riukiu* the Japanese.

USEFUL MINERALS AND METALLURGY OF THE JAPANESE.

E.—GOLD.*

BY

DR. GEERTS.

Read before the Asiatic Society of Japan, on the 16th of February, 1876.

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Gold, 金 *Kin*;. Syn. *Ki-gane* (yellow metal), *O-butsu* (yellow matter), *An-tan*, *To-nan-yo-nitsu* (sunshine in the South-east), *Kiyo*, &c., was first found in Japan in the year 749, during the reign of the 45th Emperor

* LITERATURE.—*Kaempfer's*, History of Japan, I. Book, Chap. IV. and VIII. *Thunberg*, Voyage au Japon par *Langlès*, Paris, 1796, Vol. III., p. 439. *Stan. Julien et Champion*, Industries, &c., p. 38. *B. S. Lyman*, Report of the Geological Survey of Yesso, Tokei, Kaitakushi, 1874. p. 36 *H. S. Munroe*, the Gold fields of Yesso, in the *Japan Daily Herald*, Mail Summary, June 23rd. 1875. *J. H. Gubbins*, Notes of a Journey, &c., and a Visit to the Mines of Sado, in the Transactions of the Asiatic Society of Japan, 1875. Chinese Technology:—*Thien-kong-khaï-wu*, 天工開物 (Japanese Ed. *Ten-ko-kai-butsu*), Vol. VII., Tab. 4. Natural History, *Hon-zo-ko-moku*, 本草綱目 Vol. VIII., Alt. Fig. 1 and 2. *Ono-Ranzan's Hon-zo-ko-moku keï-mo*, 草本綱目啓蒙 Ed. 1847, Vol. IV., p. 1. *Jap, Technology*, *San-kaï-meï-butsu-dzu-kuwai*. 山海名物圖會 Vol. I., Tab. I., IV., V., VI., XIV. *Japan Encyclopedy*: *Wa-kan-san-saï-dzu-kuwai* 倭漢三才圖會 Vol. 59. *Jap. Mincralogy: Seki-hin-san-sho-ko*, 石品產所考 2 Vol. *Jap. Statistics: Naï-guwai-ichi-ran* 內外一覽 1 Vol.

Sei-mu (or *Sho-mu-tenno*). This first gold came from the district Odagōri, in the province of Oshiu. The Prince of Suruga presented in the following year (750) to the Mikado some gold, which was found in his province. Since ancient times there have been rumours abroad about the enormous wealth of gold-ore in this country. Before Kaempfer's time there had already been such an exaggerated belief. Those stories about the richness of Japan and especially of the much desired "*gold* and *silver islands*" (kin-shima and gin-shima) have dazzled the minds of many foreigners.† Kaempfer (1692) and even Thunberg (150 years later) indicate the situation of these islands at a distance of 150 miles East, or E. N. E. off the coast of Oshiu. The Spaniards had tried in vain in 1620 to find them. The Dutch sent two vessels in 1639 the *Engel*, and the *Graff*, under command of *Mattys Quast* and *Abel Tasman*, in search of these precious islands, but they returned to Formosa, after having sailed 600 miles at 37½° N. L. East of Japan, without seeing any traces of land. In the year 1643 two other vessels, the *Castricum* and the *Breskens*, were ordered under Commander *Vries* to explore the Northern Pacific Ocean, the East coast of Siberia and the gold and silver islands East of Japan. Our eminent Dutch navigator did not, however, find the latter, but he discovered first the Bonin Islands, second the Island of Yesso, third the Kunaschiri, fourth the Iturup (Staten-land), and fifth the Urup (Compagniesland).

The accounts of the richness of Japan in gold-ore, have been copied from book to book, without having been sufficiently weighed and tested. When the Portuguese first came into contact with the Japanese—and even still many years later—there was a considerable stock of pre-

† Vincent [illegible] wards William Verstegen, who came back from Desima [illegible] in a memorial to the Governor-General Henricus Brouwer (1635), stating the great importance for the East Indian Comp. to commence a trade with the Gold and Silver islands, situated in the Pacific Ocean at 37½ degrees North Latitude. [Cf. Reis naar de Eilanden ten Noorden en Oosten van Japan door *Maerten Gerritszoon Vries* in 1643. Transactions of the Royal Institute of Netherlands India. 2nd Series Amsterdam, 1858.—]

cious metals, and especially gold in this country. This relatively large amount of gold does not prove, however, the extreme richness of the country, because it was in reality the product of gold-washing during many centuries. Japan being closed at that time to nearly the whole world, the gold remained in the country and augmented with every year. Under such circumstances the quantity of gold must have been considerable after many centuries, even if the country contained but a very moderate quantity of ore. The extreme cheapness of labour in former times allowed of gold-washing out of very poor gravel, which could not, without a decided loss, be worked either in Europe or America. The production of gold being moreover larger in relation to silver than in other countries, the relative value of the first precious metal became quite different from our standard. Whilst in Europe the relation between gold and silver varies only a little between 15 to 16 : 1, there has been a time when this relation was in Japan 6 : 1. The Portuguese and afterwards the Dutch have had the advantage of levelling the ground considerably, whilst the opening of Japan in latter years has done the rest. The quantity of gold metal exported by the Portuguese during their stay in Japan, 1550-1639, may be estimated at least fifty nine and a half millions sterling, or in average at 660,000 yearly. Kaempfer speaks even of some years with an export of two and a half millions of gold and adds in his peculiar style (Book iv, chap. v) " if this trade had lasted " but twenty years in the same degree, the Portuguese " would have exported (out of this Ophir to Macao) the " same quantity of gold and silver, which the Bible says " that there was in Jerusalem, during Solomon's time.

The Dutch afterwards exported chiefly copper and silver from Japan, bnt also gold, especially from 1649-1671. The quantity of silver exported by the Dutch alone during the seventeenth century may be valued at 112 millions of taels and the quantity of gold exported during the same period at 6,192,900 pieces of the old *koban*. During the eighteenth and nineteenth centuries there were besides ex-

ported considerable quantities of gold and copper. The whole quantity of Japanese gold and silver exported during the 16th and 17th centuries may be estimated as follows:

Portuguese...gold and silver.....			£59,500,000
Dutch.....gold	£15,482,250	}	£43,482,250
silver	£28,000,000		

Or nearly 103 millions.

We have had the opportunity of seeing many gold-ores out of different parts of Japan; the last exhibition in Kiyoto (1875) had about twenty samples accurately labelled with the localities of occurrence of nearly all those provinces, in which gold is more or less worked. By the kindness of the local government we obtained and examined these specimens, together with the samples in our former collection. Most samples consisted of ochry silicious conglomerates and ochry argillaceous gravel, there being very few samples of more dense and pure auriferous quartz or feldspar. Nearly all rocks had a disintegrated character, caused by the long-continued action of air and water. The samples of alluvial auriferous gravel proved undoubtedly their origin as products of disintegration from primitive rocks, under the continued action of torrents. The gold in these alluvial deposits was found in very small scales, so that the aid of a lens was necessary to discover them, and in many instances the gold-dust could only be ascertained after a process of washing and levigation. Gold in dendritic forms we have only seen in some samples of pure auriferous quartz from Satsuma and Kai. The general aspect of all these ores was poor.‡ Considering further kinds, we cannot but believe that Japanese auriferous gravel or quartz is as a rule poor, although these gold-

‡ When we speak of "general aspect" we must leave the question of the *quantitative amount of gold* open, because it is impossible to make an exact determination in a single piece of *poor* gold quartz. To determine practically the value of these ores a certain volume, say one cubic metre, of rock or gravel must be taken, crushed, washed etc. The resulting gold dust must then after purification and drying, be carefully weighed on a chemical balance.

bearing minerals occur, often in considerable quantity, in many different localities. According to Japanese books on the subject "pepitas's" (nuggets) were often found in former times but of late the gold-washer gets nothing but "gold-dust." In many places a workman, who washes gold-gravel for four or five days cannot obtain more gold-metal than is contained in an old *nibu*. Many gold-bearing places are now lying without being worked, because it becomes more and more difficult to work the ores with profit, on account of the wages of workmen having considerably increased during the latter years, since the abolition of the *daimios*. With exception, perhaps, of the ore in Satsuma, the gravel of O-sümi, the quartz of Komagōrï in the province of Kai and of Esashigori in Rikuchiu and of the mine at Aikawa in the island of Sado, we cannot believe that gold-metallurgy will enjoy in Japan a brilliant future, because most of the ores at other places are too poor and cost therefore too much labour in separating the gold-dust.

The manner in which the Japanese work the gold-ores nearly resembles our Western methods and deserves much credit. They understand perfectly the separation of even the smallest quantities of gold dust from other stones and gravel, by means of a system of washing and levigation.

The different ores are;

1.—Alluvial Sand and Gravel 砂金 Sha-kin or Seï-kin or Sui-kin. The Japanese distinguish according to the dimensions of the gold found in this ore:

a. Mominuka or *Kokin* or *Ku-to-kin* 狗頭金 (heads of dogs); these are the largest nuggets or rounded masses.

b. Uri-sané-kin (Melon seed-gold) or *Kuwā-shi-kin* 瓜子金 of the size of melon seeds.

c. Nassubi-sané-kin (Tomato-seed‖ gold) or *Fu-baku-kin*. 麩麥金 a little smaller than the other.

d. Sha-kin 砂金 gold-dust.

‖ Solanum melongana Linn.

These are found in the beds of old and existing rivers. The Japanese believe, but not always rightly, that the gold produced by rivers is not of the same good quality as the gold from rocks. They believe also that this gold is poisonous (?) and that the flesh of the "Shako" and of snakes is an antidote to it.

2.—Auriferous Rocks of Quartz "Feldstone" or other silicious Conglomerates 山金 San-kin or Yama-gane. The rock itself bears the name *Haku-seki* or *Fun-shi-seki*. According to the dimensions, the Japanese distinguish of *yama-kin* the following varieties:

a. 馬蹄金. *Ba-tei-kin* (Horse-shoe-gold) the largest pieces.

b. 橄欖金. *Kan-ran-kin* (Chinese olive § gold) or *Tai-kuwa-kin* 帶勝金.

c. 黃牙. *Oga* or *koga* or *Insu* gold of auriferous rock which forms stalactitic masses.

3.—Gold, which is disseminated in other compound metallic minerals, especially copper, silver, lead-ores and iron-pyrites. The Japanese now understand the separation of the small amount of gold from these ores by the liquation and cupellation-process, which we have already described under the head of silver (vol. 3, part 1, p. 90).

Gold Metal, after it has been purified and melted in different shapes, bears different names:

1. 鏐.—*Kiyo* or *Shima-kin*, large flat oblong pieces, very fine gold; rare.

2. 熟金.—*Juku-kin* (ripe gold) or *Mochi-gané* is the ordinary button-form of good ordinary gold.

3. 金鐵屎.—*Kin-tetsu-ki* or *Kana-kuso* gold out of auriferous iron pyrites not so pure as the former.

4. 黃金.—*Ogon* or *Kogané* is of much lighter colour, more yellow or greenish and considered very common.

5. 砂金.—*Shakin*. Gold in powder. The colour is much lighter than that of *Juku-kin*, but after melting and repeated hammering it is believed that it can become *juku-*

§ Canarium Pimela Roxb.

kin (ripe gold). *Shakin* is generally considered to be of low quality.

6. 金箔 *Kimpaku* gold-leaf.

7. 金絲 *Kinshi* gold-thread.

The native writers call gold the " king of the five metals (gold, silver, copper, iron and tin). Although buried for many years, it never rusts and it loses nothing of its weight, even if it be smelted a hundred times. The alloy of gold with silver is pretty soft; if this alloy be struck on the touchstone *(Tsuké ishi)* a light, greenish-yellow line will be seen. But if the gold be alloyed with copper, it becomes very hard and emits a sound, when placed on the touchstone. Gold which is perfectly pure has a dark reddish-yellow colour and is so soft, that it easily receives the impressions of the teeth. Gold is further said to have an antipathy to tin and to be afraid of quicksilver."

The Chinese and Japanese judge the quality of gold principally according to its colour and hardness. They use for this a black touchstone, a variety of a black basaltic siliceous slate (kïezelschiefer) perfectly resembling our Lydian-stone and very near to the fine black Japanese inkstones *(Sudzuri ishi)* which consists of ordinary black siliceous slate. By the different colored marks the experienced Japanese analyst judges the purity of the gold, and for comparison he has in stock a collection of golden needles of different alloy. The touchstone is rubbed at the same time with one or two of the needles and the gold in question. The Japanese scale of fineness is much better that ours, being decimal. Perfectly pure gold has 100 touches; if the gold has 85 touches it contains 15 per cent of alloy, and 85 per cent pure gold. At the same time the hardness of the metal is observed accurately, and this is quite necessary because a distinction according to colour can only be deemed a very rough and inexact one. For it is very easy to give different shades —even the so much praised high red-orange colour—to gold by mixing with it specific quantities of copper and other

metals. Nevertheless the careful Japanese expert but seldom misses the aim. We have ourselves had many proofs of Japanese assayers giving us a percentage of samples of gold and silver, which only differed slightly from our chemical analysis. Although we highly respect the skill of these experts, their method is far from being as accurate as our wonderful results of analysis by the wet process, which is in reality a model of precision.

But besides colour and hardness, the Chinese and Japanese books give another method of testing. They prescribe the drawing of a line with the gold on the touch-stone, then the comparing of this line with other marks of the touch-needles and finally to bring the line into contact with a very little molten sulphur. If the gold is pure, the mark preserves its bright colour unchanged, but if it contains silver or copper, &c., the line will become dark coloured. The larger the amount of these metals present, the darker the colour of the line. It is clear that this simple but rough method of testing rests on the principle that sulphur does not combine at all directly with gold, whilst it forms dark-brown and blackish compounds (sulphides) with copper, silver, &c. In addition we must, however, say that we have not seen a skilled Japanese assayer practice this method and we must also state that this *virtuoso* considered the last sulphur-essay perfectly superfluous, being already quite sure of his conclusion by judging the colour and the hardness.

The old gold coinage of Japan was an alloy of gold and silver and not like the European and the present Japanese gold pieces a mixture of gold and copper. These old gold pieces varied very much in their absolute weight as well as in their alloy, so that the real intrinsic value could not be ascertained accurately. The old pieces were :—

1.—The *ō-ban* 大判 large flat oblong pieces, only in use with the Shoguns and old *daimios*. Value variable from 20-26 *koban*.

2.—The *koban* 小判 *ichi-riyo-kin* also an oblong flat piece (alloy of gold and silver) having a legal value of 60

mommé silver, but varying in reality from 58-65 *mommé* silver. Since the year 1707 *kobans* were made smaller in size. The new *koban* (*Ho-yeï-koban-kin*) must therefore be carefully distinguished from the old pieces. According to many assays, formerly made at Batavia, the percentage of gold of the *koban* differed enormously between 542-833 per mille, although they had generally a standard of 631 per mille.

3.—*Nibu-kin*, 二分金 originally half a *koban*. No piece of money in the whole world has had such a variable and arbitrary standard as the *nibu*. The intrinsic value varied between $0.17—0.55. The following table which gives the composition (per mille) of a number of Satsuma and Tokugawa *nibus*, will closely prove the irregular composition of these money-pieces.

Tokugawa-nibu.			Satsuma-nibu.		
Gold.	*Silver.*	*Alloy.*	*Gold.*	*Silver.*	*Alloy.*
225	762	13	39	900	61
232½	753½	14	20	955	25
227½	760½	12	41	934	25
225	764	11	37	908	55
223	761	16	37	906	57
225	763	12	37	923	40
231	756	13	53	891	56
226½	761½	12	34½	922½	43
225	763	12	41	912	47

4.—*Ichibu-kin* 一分金 originally the fourth-part of the *koban*; seldom met with of late.

5.—*Nishu-kin* 二朱金 originally the eighth-part of the *koban*, rare.

6.—*Ishu-kin* 一朱金 originally the sixteenth-part of the *koban*.

The new Japanese gold money pieces have all a fineness of 900 per mille, alloyed with 100 parts of copper.

Metallurgy of Gold.

The Japanese manner of extracting the gold from the auriferous minerals is very simple and agrees in the main

points with our old western method. The whole process may be divided into two principal stages.

1.—If the gold—as is mostly the case—is to be extracted from sand or alluvial deposits of rivers and torrents, then the separation of the small gold scales is effected by *washing* the gold sand, either on an inclined plane or levigation apparatus, or directly on mats in a washing ditch. This process is called *kanêyuri* or washing of the metal.

2.—The gold-dust obtained by the washing process is melted on a bottom of calcinated salt, until a button or half round nugget *Mochi-gane* or *Juku-kin* is obtained. This process is called *kin-toku* (Gold-melting.) In the gold mines where the auriferous mineral consists of hard quartzrock, feldspar or feldstone (*haku-seki*), the ore must be crushed first by means of large iron hammers (*kanamê-tsuchi*.) It is then roughly powdered in a mortar, in which the pestle is worked by the foot (*karausu*), and finally ground in a stone mill (*tsuki-usu*.) Being thus minutely divided, the powder is washed in the same way as above.

When the ores consist of auriferous metallic sulphides, (copper or iron pyrites, grey copper-ore, etc), they are first crushed and roasted. The roasted mass is powdered and melted until a coarse metal is obtained. The latter now contains the whole of the gold. The crude metal is then fused with some lead, which extracts the gold and falls to the bottom, (*Dê-namari*). The alloy of lead and gold is then finally treated by a cupellation process.

The process of extracting gold from the ore by means of amalgamation with quicksilver is unknown to the Japanese.

The Japanese possess no good process for the separation of gold from silver. Hence, all Japanese gold contains more or less silver.

We will now proceed to describe the whole working more minutely and suppose that we are visiting a gold mine, where hard auriferous quartzrock, or feldstone, is to be worked. According then to old Japanese custom,

first a feast, the feast of the mountain-gods *(Yama-no-kami-sama)* must be celebrated at the mountain or place *(kana-yama)*, where a gold mine is to be opened. The best and most propitious day for this feast is the 9th day of the 7th month. A small temporary shrine is constructed and wrestling and other kinds of amusements *(mise-mono)* are ordered from Kioto or Osaka to amuse the villagers and the miners (下財 *késai)*, who all enjoy the festival of the opening of a new mine. The priest, or *Kannushi*, takes care to ask the favours of the gods for the new enterprise, as can be clearly seen by the first of our engravings.

The gods being thus propitiated, care is taken to provide for the daily wants of the miners, who are often obliged to work at a great distance from other habitable places. A kind of store-house and mining-office, called 臺所 *dai-dokoro* (great kitchen) is therefore built near to the entrance of the new mine. In the provinces of the west of Japan this store-house is called *kamba* (office for payment). This *dai-dokoro* or

勘場 *Kamba* is also the office, where the miners get their payment, either in money, or such articles as charcoal wood, fagots, salt, oil, *Shoyu*, rice and all other necessaries of daily life. Peasants and merchants repair to this place to sell their products of merchandise to the officer in charge of the office by whom all accounts of income and expense are settled and kept. The artist has depicted the *dai-dokoro* in the second engraving.

The second necessity consists in the 床家 *Toko-ya* or a house where a forge is first constructed for making and repairing the necessary tools and mining utensils; secondly several foundries are erected for melting the metal in bars or cakes. The officer in charge of this place is called *Toko-yakunin* and ranks second to the chief officer of the mine. The third design gives a representation of the *Toko-ya*.

After all these preparations are made, the miners commence to open the mine. The chief gallery *shiki-guchi*,

四ツ留メ口 *yotsu-domé-guchi*, is first constructed according to the directions given by the *Shiki-yakunin* or chief officer of the mine. The upper floor *(kesho-ki)* and the sides *(ya)* of the galleries are supported by wooden beams, called 留メ木 *toméki*. It is usual to give the gallery a precisely square form of sixteen beams in every direction, and generally this chief gallery has a moderate incline, as already described under the head of copper. If the main entrance be of considerable length, air-shafts, *kazé-mawashi-guchi* 風廻シ口 are constructed in a similar manner, and finally several gangs and reservoirs are cut out in the main gallery for the removal of the mine-waste *(O kiri-guchi* 大切口 or *midzu-nuki)*. Very much labour is spent on the removal of the water, the only machinery consisting of two kinds of pumps *(to-yu)*, namely a round one made of bamboo, called *také-midzu to-yu* and a square one, made of wood, *ki-midzu-to-yu*. The water is pumped from one reservoir to the other, until it has reached the outside of the mine. It is obvious that the difficulty in removing the water increases enormously with the depth of the mine. Very often mines are wholly abandoned on account of the water requiring too much cash and labour to be kept under. The drawings on figures 4, 5 and 6 give some idea of the manner in which the galleries are constructed.

We must now turn to the miners, those laborious men, artificers who are compared by the author of the Chinese Poem *Ra-in* with the bees, in the saying "with toilsome "labour the bee collects honey out of thousand flowers, "but for whom is the sweetness?" But we will first describe shortly the different tools of the miner, as they are represented on Table VII. There are :—

1.—The *Tsuru-bashi* or iron pick, for loosening the gravel and rocks.

2.—The *Takané*, or long iron chisel or wedge, for breaking the rocks.

3.—The *Mago-hachi*, or short steel wedge for crushing very hard rocks.

4.—The *Yama dzuchi*, ordinary (small sized) mining hammer, worked with the *takané*.

5.—The *Genno*, or heavy large iron hammer for driving the wedge or *mago-hachi*.

6.—The *Sazai-hito-boshi* or mine-lamp, consisting of a shell filled with oil and a wick made of the pith of a kind of rush.

7.—Three kinds of *Kuwa*, or hoes (mattocks) to remove stones, earth and gravel.

8.—The *Joren*, or hoe-shaped bamboo baskets for removing gravel and earth.

9.—The *Yebu*, or long baskets for removing débris from the mine.

10.—The *Datsu*, or cylindrical baskets for receiving the ore. The filled baskets are carried on the back of women or miners, each basket containing from 40—50 kilogrammes of ore.

11.—The *Yenza* or *Tebu*, or round thick mat, which the miner wears on his girdle and which serves him as a chair, to sit upon.

12—The *Masu*, or measuring box, for measuring the quantity of ore to be washed.

13.—The *Kanamé-tsuchi*, or long hammer, for cleaning the ore from the adhering stones, which work is mostly done by women and children. (Fig. 8).

14.—The *Kara-usu*, or mortar for powdering the ore by means of a pestle, worked by the foot.

15.—The *Usu*, or stone mill for pulverising the ore roughly.

16.—The *Také-midzu-toyu*, or round bamboo pump.

17.—The *Kimidzu-toyu*, or square wooden pump.

18.—The *Nekota*, or washing apparatus, so called "Long Tom," consisting of a water-reservoir and wooden inclined plane (Fig. 7 and 9).

19.—The *Midzu-Sagashi*, or cotton sweeper, to stir the gold sand in the water on the inclined plane.

20.—The *Nadeki*, or wooden broom, being two pieces of wood fixed cross-wise, for the same use as the former tool.

21.—The *Nekoza*, or straw mat, for collecting the gold-sand, when the washing of gravel is carried on in a washing ditch and not on an inclined wooden plane.

22.—The *Yuri-bachi*, or goldwasher's pan, consisting of a wooden dish. This tool is used for separating the gold from the concentrated sand.

23.—The *Kané-yuri-ita*, or a slightly warped and dishshaped board for the same use.

24.—The *Namban-buki-ya*, or furnace for melting metal mixtures which contain gold, with lead in order to extract the gold by the melted lead. (Only used when other metallic ores are worked for gold).

25.—The *Geshi*, *Kara-mikaki* and *Portuga*, flat iron scrapers for collecting the gold- or silver-containing lead, which has run out the above furnace (Fig. 11.).

26.—The *Kawa-koki*, or long charcoal-scoop for regulation and feeding of the charcoal fire.

When the miners have brought their ore out of the mine, the women commence by crushing it roughly with long hammers ; subsequently it is powdered in the mortar and stone mill. The powder is now given into the *Nekota* (Fig. 9), the water of a bamboo aquaduct running into this reservoir and flowing off, through the opening below, on the wooden plane. The gold sand runs off with the water, but being much heavier than the samll particles of sand and gravel, the gold-dust remains in the greater part on the wooden plane, where it is collected and still further washed by the cotton sweeper. The water runs finally into a large hole where the heavier gold-dust which might have escaped from the plane, sinks to the bottom and can be collected afterwards. This process of washing on the inclined plane is called *Neko-tana ga-shi*. The gold-sand being thus concentrated, it is transferred to the shallow wooden washing-board, or the so called "pan." This is done with great care in a large wooden tub (*Han-kiri-oké*) filled with water. The board is first floated on the water and the sand slightly shaken by a slight oscillating motion. From time to time the board is raised from the water and

the less heavy sand washed away from the gold by some quickly effected longitudinal jerks. Thus alternately and skillfully moving the board, the bright yellow gold grains become more and more visible and separated from the sand or quartz. Finally the gold dust is dried and further separated, by blowing, from some heavy iron sand, which is generally still present. This process of washing on the board, which requires great skill and dexterity is called *Ita-yuri*. Our Japanese author of the *San-kai-mei-butsu-dzu-kuwai* states that the gold washers receive no money, because they can sell the gold-dust which remains in their clothes ! (*Todjigané*.) He adds that in former times the gold washer found often some small golden nuggets in his dress but of late this is no longer the case. It would seem therefore that the gold washer in the latter times receives payment for his labour.

The gold thus obtained is now fused and hammered in the *Tokoya*, in order to obtain a metal button or bar. A round cavity is made of 10 parts of calcinated salt and buck-ashes and one part of gold-dust put on it. By means of a strong charcoal-fire the gold becomes fused and is then strongly hammered until the piece of metal has the desired shape. In this state it is called *Mochi-gane* (metal-cake) or *Juku-kin* (ripe gold.)

The Japanese use, besides the process now described and actually followed at the gold mines (mountains), still another method of washing, when the gold is to be extracted from the the gravel or sand of rivers or other alluvial deposits. This process is more simple than the working of the harder rocks, and has already been described with much accuracy by Mr. H. S. Munroe in his report of the gold fields of Yesso. We will therefore only take the main points of Mr. Munroe's account. Table X. gives a slight idea of this washing process. Mr. Munroe has compared this Japanese method practically with those in use in Europe and America, namely, the washing with the " Cradle " and with the so called " Long Tom," and, he has arrived at the interesting conclusion that the Japanese process gives far better results than any of these

western methods. The working with the sluice "is generally considered to be by far" the best of the foreign washing-methods, but Mr. Munroe had no opportunity to use this method in Yesso; nevertheless his experiments leave no shade of doubt, that the Japanese process is better than those with the "Cradle" or "Long Tom."

It is much to be regretted that the numerous experiments, made by order of the Kaitakushi in the so-called gold-fields of Yesso, which had—until lately—such an enormous reputation for their richness, have not given better prospects of a profitable gold production in this country. The chief result of all the researches in Yesso is that in none of the gold fields the amount of gold was large enough to give much encouragement to working.

This second Japanese method then consists in washing in a "ditch" made from the bed of a river by putting walls or banks at such a distance that the washing ditch has a width of two or three feet and a length of fifteen or twenty. The afflux of water from the stream must be thus regulated in order that the water in the ditch should have a velocity of 1½ to 2 feet per second and that about 60 to 80 cubic feet of water per minute are obtained. Care must be taken thatt he walls of the ditch do not permit the water flowing outwards to the stream. The gravel is then shovelled from the measuring box (one-half cubic metre) into the head of the washing ditch, and the box refilled with gravel. The gold-washers then stir the gravel, throwing away the large stones by hand and separating the smaller stones from the sand by means of a bamboo basket *(joren)* and a hoe *(kuwa)*. The fine sand, clay, &c., are thus washed out by the rapid current. When some four to six boxes (2 to 3 cubic metres) of gravel have been shovelled into the ditch and broken in the same way, the gold washer commences to wash on mats *(Nekoza.)* These mats are placed side by side across the stream, at a little distance below the place where the gravel lies. The workmen now remove the latter to the head of the mats, by which action the heavy gold and iron sand sink on the mats, whilst the lighter

sand and gravel pass down stream. When all the gravel has thus been held over the mats, the latter are removed about two feet down stream, in order that a new quantity of fresh gravel may be worked.

The mats are finally removed, folded in both directions and jigged up and down in the water, to separate the lighter sand from the heavier gold-dust. The other mats are broken in a similar way and all the gold sand of the different mats is subsequently transferred carefully into one mat. From this mat the concentrated sand is finally transferred on the wooden washing board (*Kane-yuri-ita*) and further washed in the same manner as already described by the former process. This washing method, simple as it is, requires, however, great care and skill on the part of the gold washers, but with good workmen it seems to give surprising results. To prove the usefulness of this method, we will only give the results, which Mr. Munroe obtained from the same gravel, by washing with the "Long Tom" and the Japanese process :

ONE CUBIC METRE OF GRAVEL.

Long Tom:	*Japanese Method:*
2.6.....Milligram.	30.8.....Milligram.
18.0..... ,,	68.0..... ,,

For further particularities we must refer to Mr. Munroe's Report.

Places of occurrence :—

Province:	*District:*	*Localities:*	*Remarks:*
Yamato.....	.....	Kinposan Ominéya-ma.....	Worked in former times.
Iwami	.....	Kinsan	....
Ikishima	.....	.....	....
Iyo.....	.....	Furunogawa	....
Sado-shima	Hamo-chigōri.	Nishimikawa	Not worked at present.
		Aikawa.....	Govenment mine. Gubbins.
Musashi	Chichibugōri.	Nakatsugawa	....
Tōtōmi	.....	Tenriugawa.....	....
Idzu	Kamogōri	Kegurano and three other places.	Very Few.
Shimotsuké		Kochigōri	Shinoi.
		Komagōri	Yasumura.

Iwashiro	Yamagōri	Kuromori	Few.
	Aidzugōri	Takéfukayama	Auriferous siliceous conglomerate.
		Ishigamori	
		Ushiguwat-sukamura	
Iwashiro	Kawanumagōri	One place	Not worked at present.
	Asakagōri	do.	
	Shirakawagōri	do.	
Rikuzen (Mizawaken)	Kisengōri	Takekomura Giyoku-san.	....
	Kuriharagōri	Kozo-shimmachi	....
		Nino-seki	....
		Nagasaki-mura	....
	Tomégōri	Okamégawara, Inamurayama.	....
Rikuchiu	Heï-gōri	Eight different places.	Not worked at present.
	Kesengōri	Takegoma-mura	....
	Iwa-gōri	One place	Not worked at present.
	Esashi-gōri	Jinshumura, Yoshimayama.	....
Dewa, Ugo	Akumi-gōri	Two places	6½ catty gold dust per year.
	Akita-gōri	Okudzu and Ani	25 catty per year
Dewa, Uzen (Yamagata-ken)	Murayama-gōri	Yoshikawa	Good gold sand.
	" "	Iwatanizawamura	Not worked at present.
	" "	Gobo	
	" "	Takarazawa	
	" "	Tashiro	....
	" "	Kawaharago-mura	....
Yechigo	Kambaragōri	I-sozawa	⅔ catty.
	Kubikigōri	Itoïgawa	Not worked at present.
Yetchu	Niikawagōri	Matsukura	....
Kaga	Nomigōri	Kanahira	1½ catty.
Hida	Yoshiki-gōri	Moribé	....
Kaï	Komagōri	Homura	....
		Kurokawa	....
		Yasumura	....
		Hogowa-machi	....
		Kawasame	....
		Hatagawa	....
Suruga	Abé-gōri	Hikagezawa	....
	" "	Tashiro	....
Osumi	....	Yokogawa	....
Satsuma	Kawabegōri	Kagomé	....
		Yamagano	....
		Rokuro	....
		Serigano	....
Chikuzen	....	....	....
Chikugo	....	....	....

Yesso	Shiribeshi and Iburi.	Toshibetsu (River)	....
	Shiribeshi	Kudo Moshibetsu and Usubetsu.	Very poor.
	Oshima-shu.	Esashi	Very poor gold sand.
		Iimikishigawa	
		Meniu-gawa	
		Todo-gawa	
		Gokatte-gawa	
		Asabé-gawa	
		Otobé-gawa	
		Matsumai	Exhausted.
		Musa	Poor.
	Tokachi	Tobui-gawa	E'mely poor.

The best gold-field in Yesso, tried by Mr. Munroe, was that of Toshibetsu. The gold-sand here contains, however, but one-half of the amount of gold which the poorest gold-fields of California contain. The numbers obtained by Mr. Munroe may speak for themselves.

Toshibetsu Gold Field in the province of Iburi.

Gravel.	*Grammes of Gold per cubic mètre.*	*Value of cubic mètre in cents.*
Upper Toshi	0.1360	8.11
Akabuchi	0.1143	6.81
Kusubé	0.0782	4.66
Highest Terrace	0.0500	3.00
Okajisawa	0.0680	4.06
Ponkajisawa	0.0308	1.84
Chinkobé	0.0304	0.20
Nisé-umbetsu	0.0001	0.11
Average	0.0835	5.00

Kudo Gold Field in the province of Shiribeshi.

Gravel.	*Grammes of Gold per cubic mètre.*	*Value of cubic mètre in cents.*
Moshibetsu	0.0070	0.42
Usubetsu	0.0011	0.07

Esashi Gold Field in the province of Oshima.

Gravel.	*Grammes of Gold per cubic mètre.*	*Value of cubic mètre in cents.*
Otobé	0.0020	0.12
Jimikishi	0.0290	0.73
Jimikishi	0.0044	0.26
Gogatté	0.0002	0.01
Todo	0.0012	0.05
Mena	0.0008	0.05

Musa Gold Field in the province of Oshima.

Sample.	*Grammes of Gold per cubic mètre.*	*Value of cubic mètre in cents.*
Sanjinrono.....M 1369 q.	0.0319	1.89
do. .....M 1360 p.	0.0220	1.31
Shikubeno .....M 1389 c.	0.0170	1.00
Yunoshiri .....M 1376 s.	0.0111	0.60
do. .....M 1377 t.	0.0094	0.56
Minagoya .....M 1381 u.	0.0084	0.50
Average.....	0.0164	0,94

These numbers show enough that the so-called richness of the Yesso gold-field is a fiction, and that perhaps the Toshibetsu gravel only might be worked with a small profit. I must leave it to the future to determine the practical value of the ore or gold-sand at the other localities mentioned in the above list, but I believe that the metallurgy of gold will never become in Japan a very profitable industry, as is possible in the case of copper and iron.

A regular meeting of the Asiatic Society was held at the Kaisei-Gakko, on the 16th instant. Dr. Antisell occupied the Chair.

The minutes of the last meeting having been read and approved, the names of new members, Messrs. J. Troup (Kobe), T. R. H. McClatchie (Tokio), Professor E. Mondy (Tokio), J. L. Bowes, G. Ashdown Audsley (Liverpool), J. E. Day (Yokohama) were announced.

It was then stated that the whole of the property belonging to the Society—including the Library and furniture—had been removed from Yokohama and was deposited in the room No. 4 assigned to the Society's use in the Kaisei-Gakko. Professors Syle and Summers had been appointed at a Council meeting on the 9th instant a Library Committee *pro tem.* On the motion of Dr. Veeder, seconded by Professor Smith, they were requested to continue their services and to select a curator. Professor Syle stated that it was their intention to keep the Library open for members' use daily between 3 o'clock and 5.

The Secretary laid upon the table the various transactions of the learned Societies which had been sent from Europe in exchange for this Society's Journal. A discussion then ensued as to the kind of papers most desirable. Professor Grigsby objected to the number of scientific papers which were read, and he wished to know why Mr. Russell Robert-

Fig. I. FEAST OF THE MOUNTAIN GOD AT THE OPENING OF A NEW MINE.

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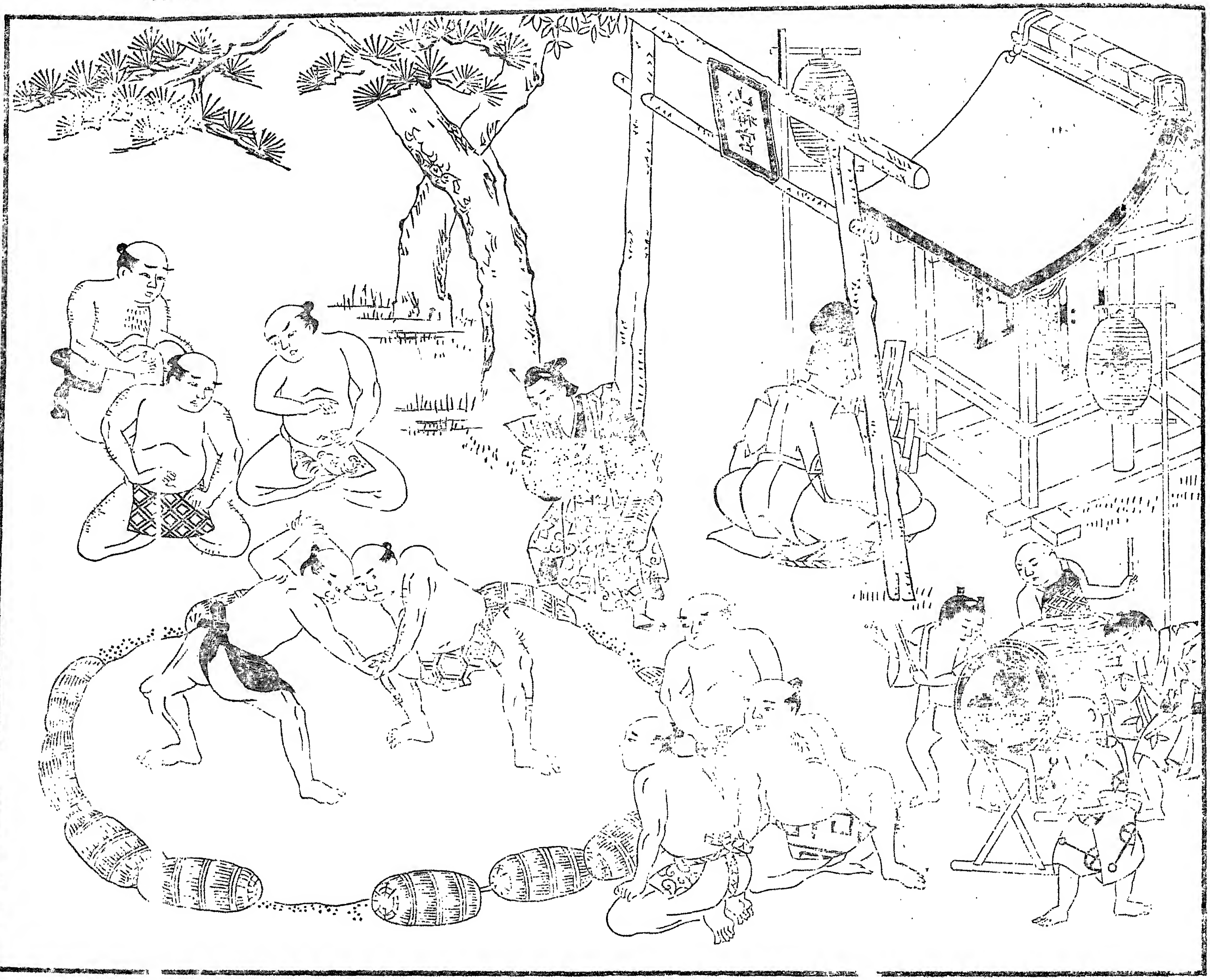

Fig. II. STORE-HOUSE AND MINING-OFFICE.

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Fig. III. FORGE FOR MAKING AND REPAIRING MINING TOOLS.

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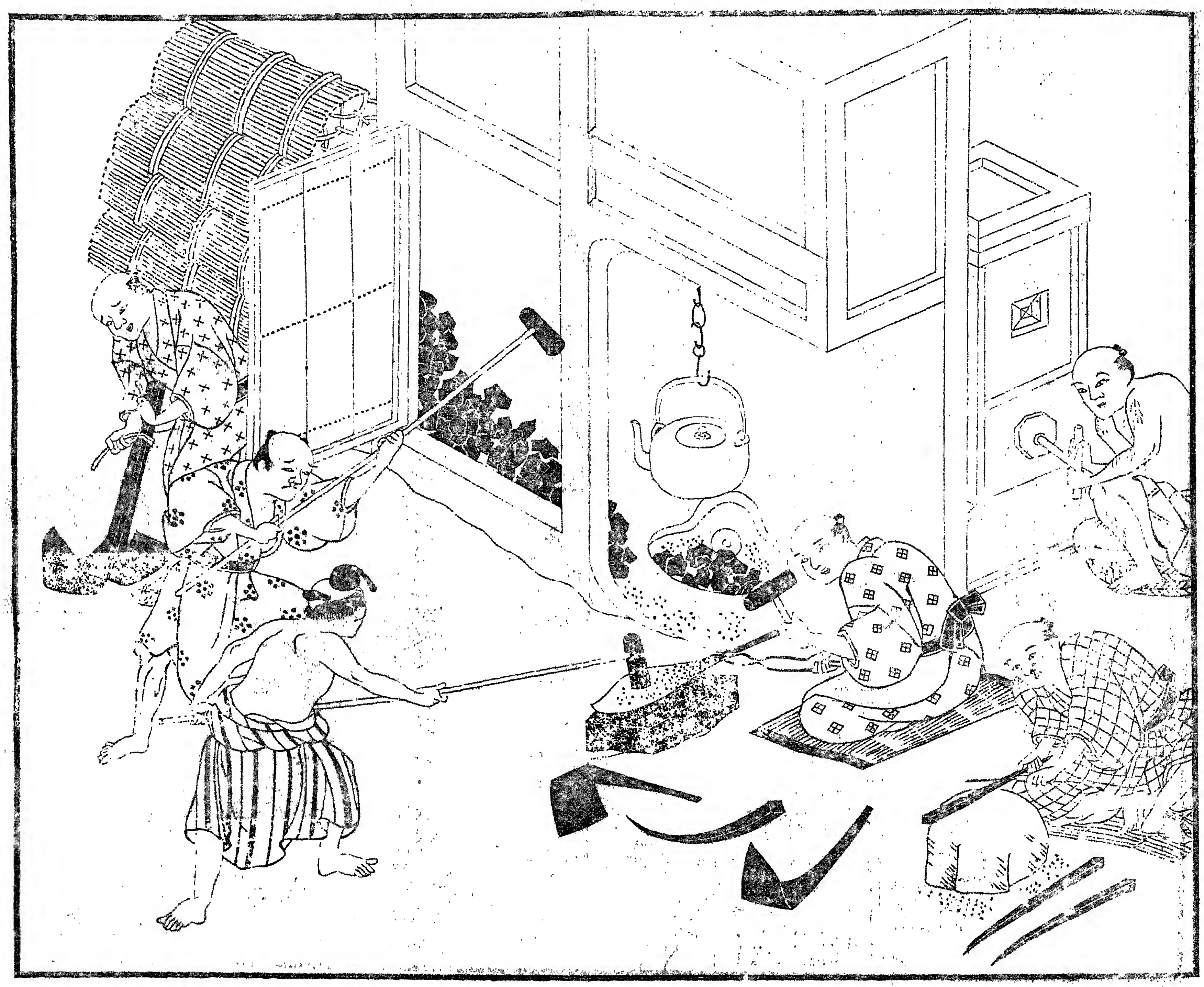

Fig. IV. **CUTTING THE FIRST GALLERY.**

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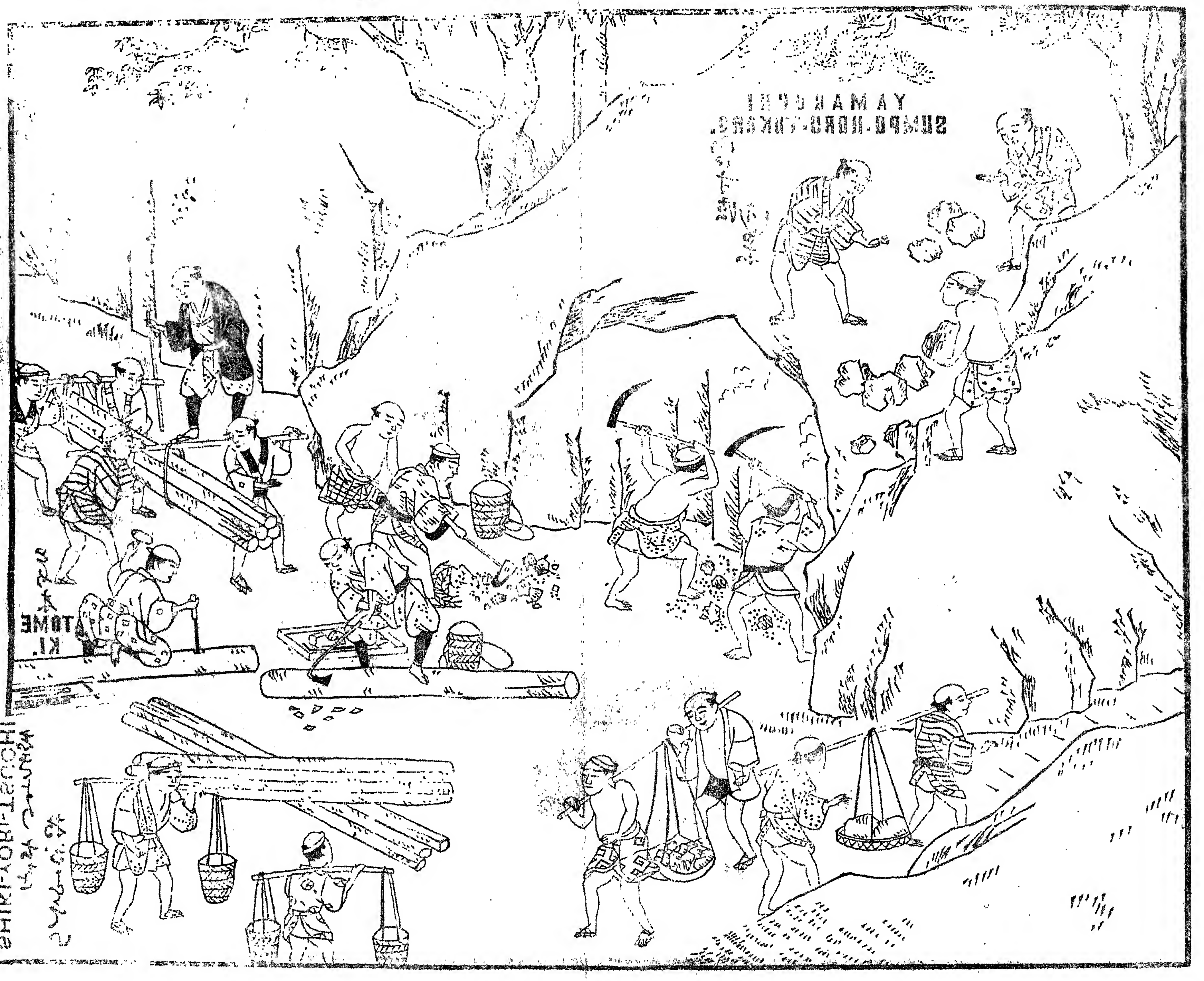
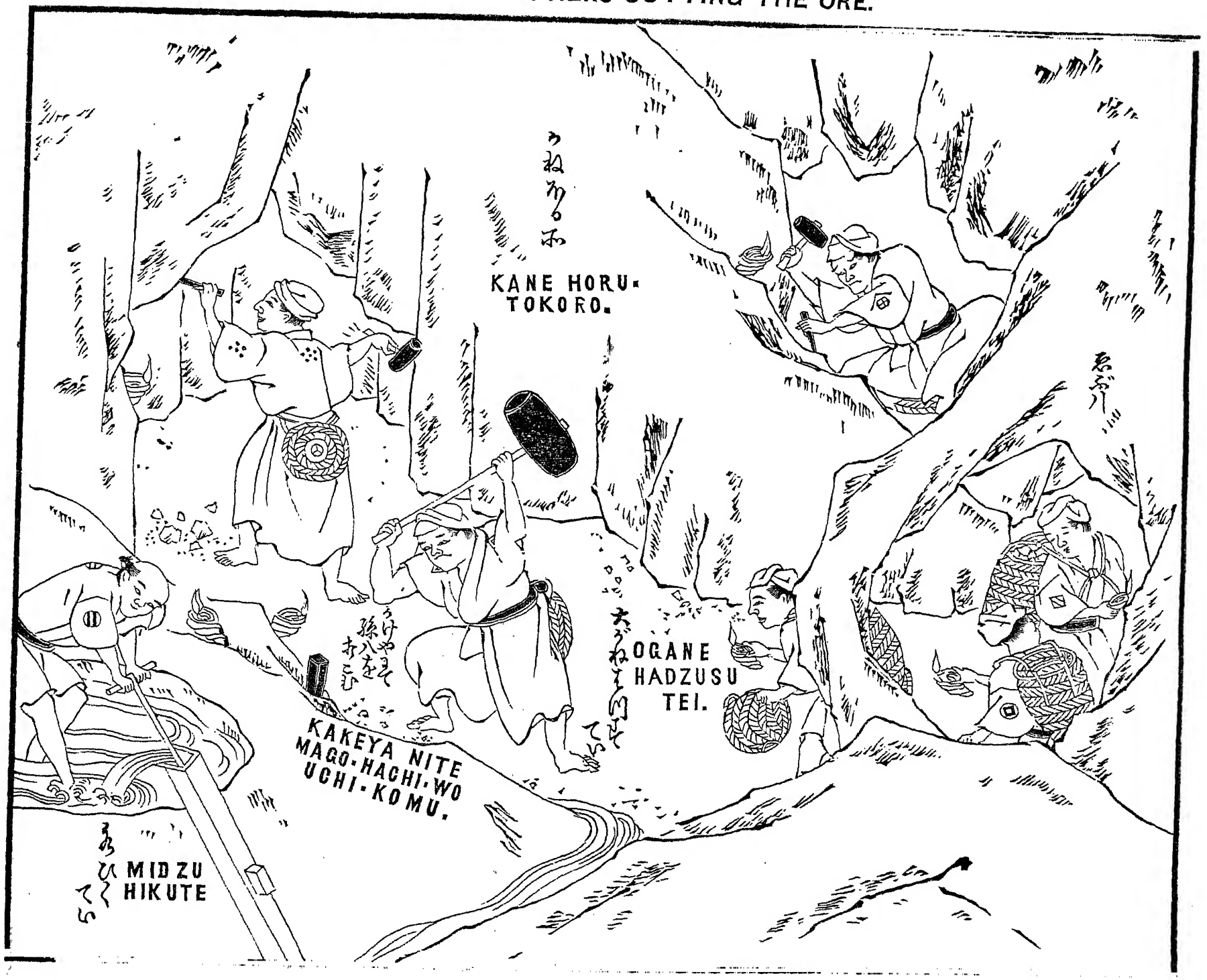


Fig. V. **MINERS CUTTING THE ORE.**



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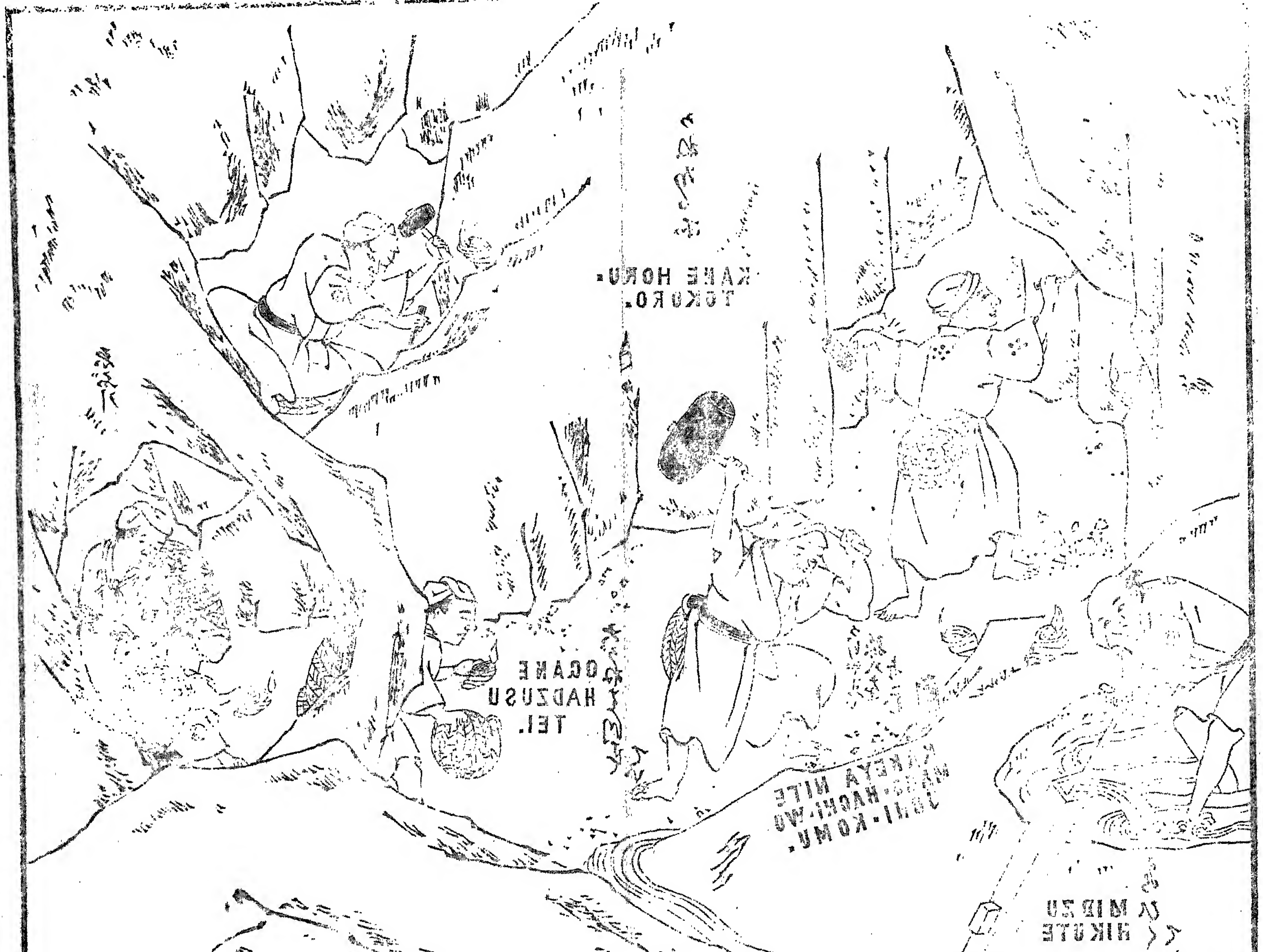
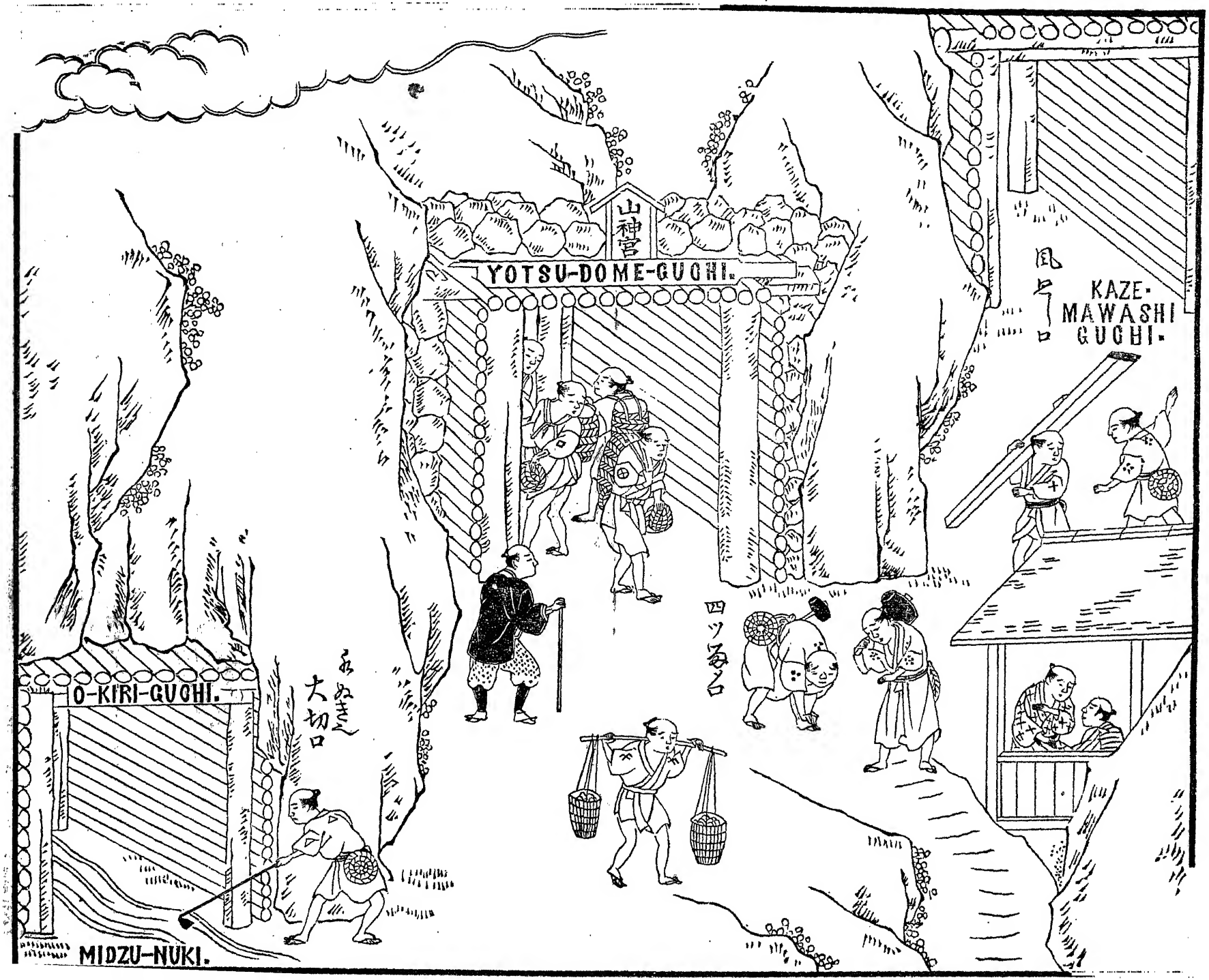


Fig. VI.

CHIEF MINE GALLERY, AIR-SHAFT, AND SHAFT FOR THE ABDUCTION OF THE MINE-WATER.



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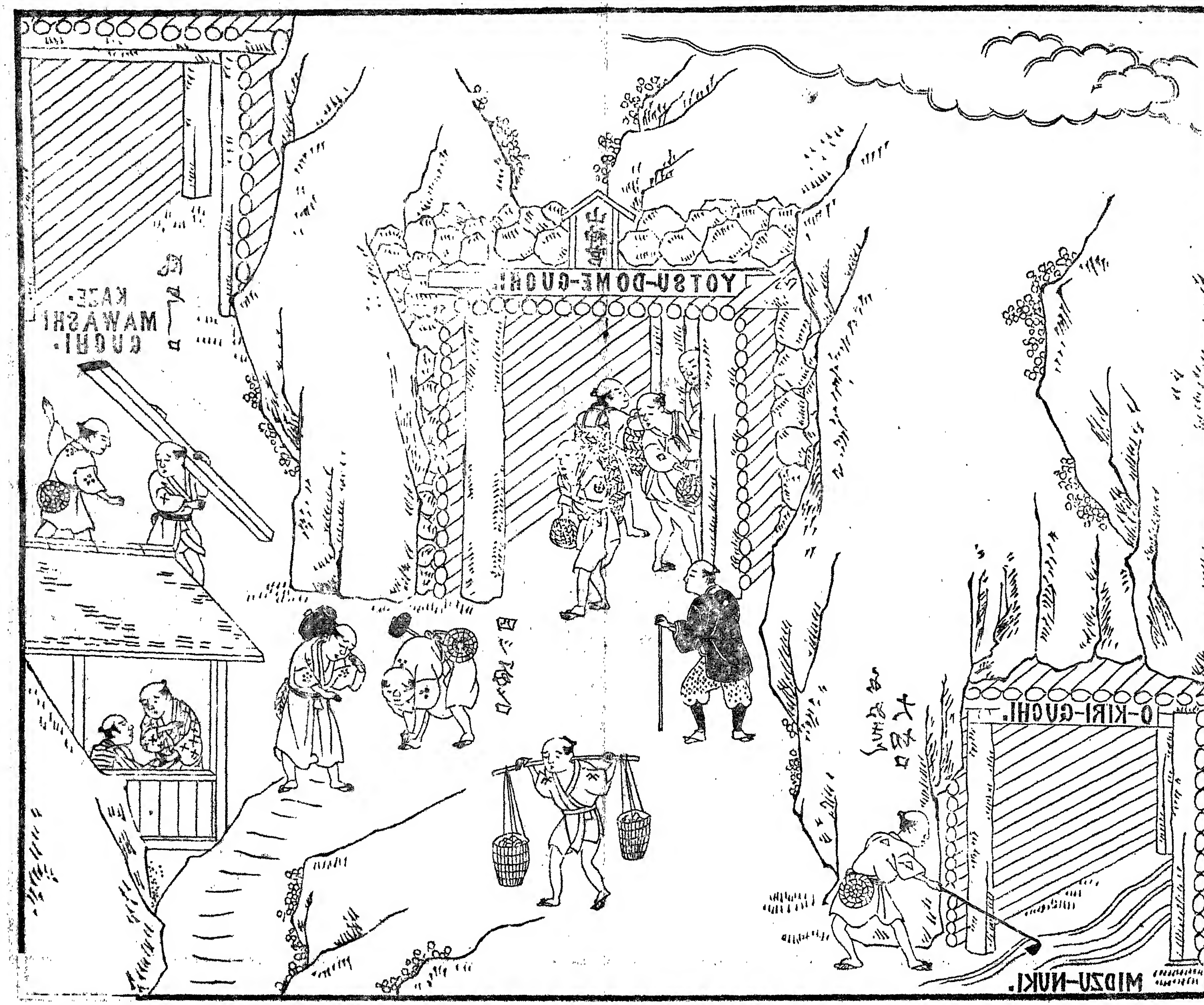
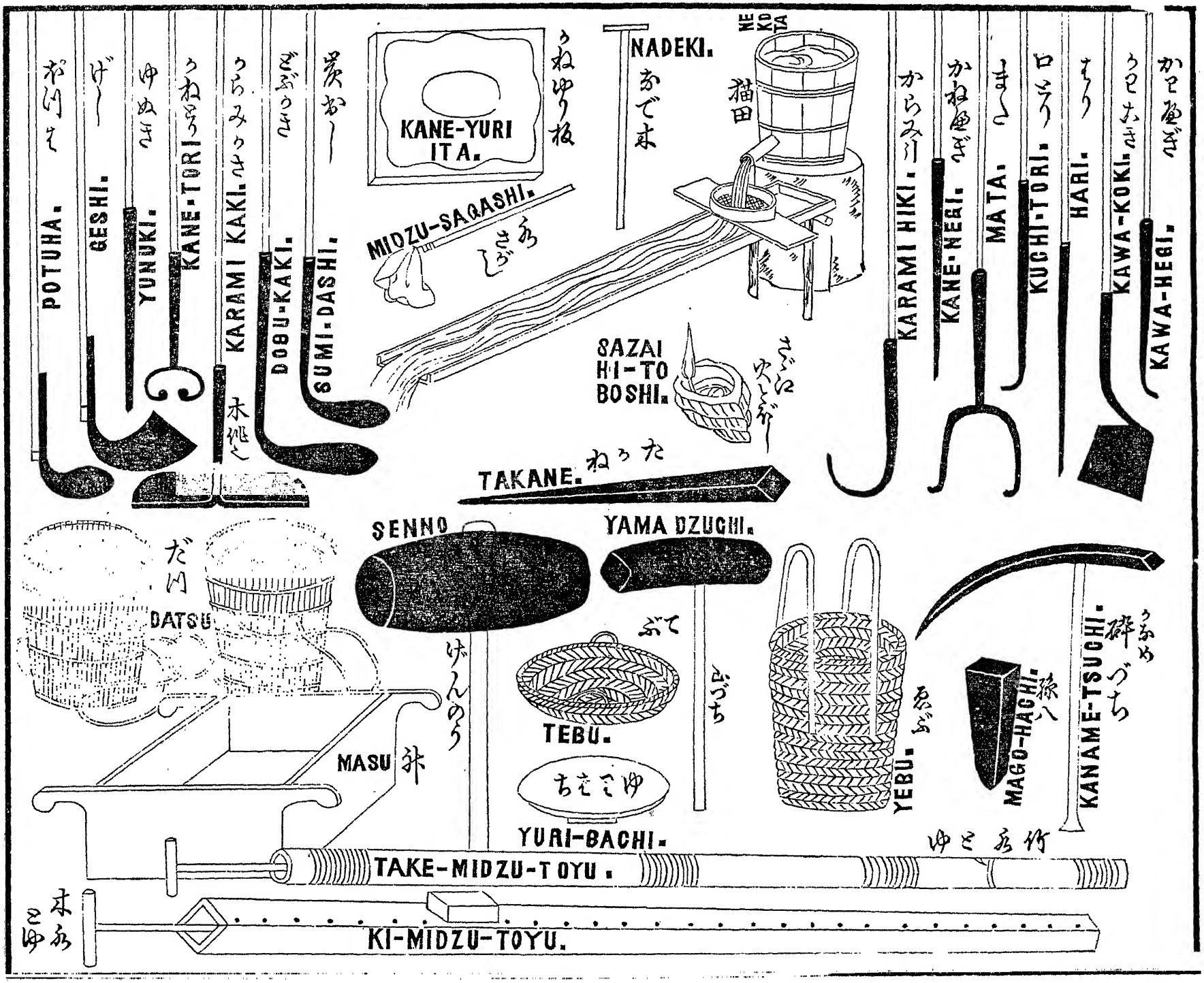


Fig. VII. **MINING AND SMELTING TOOLS.**



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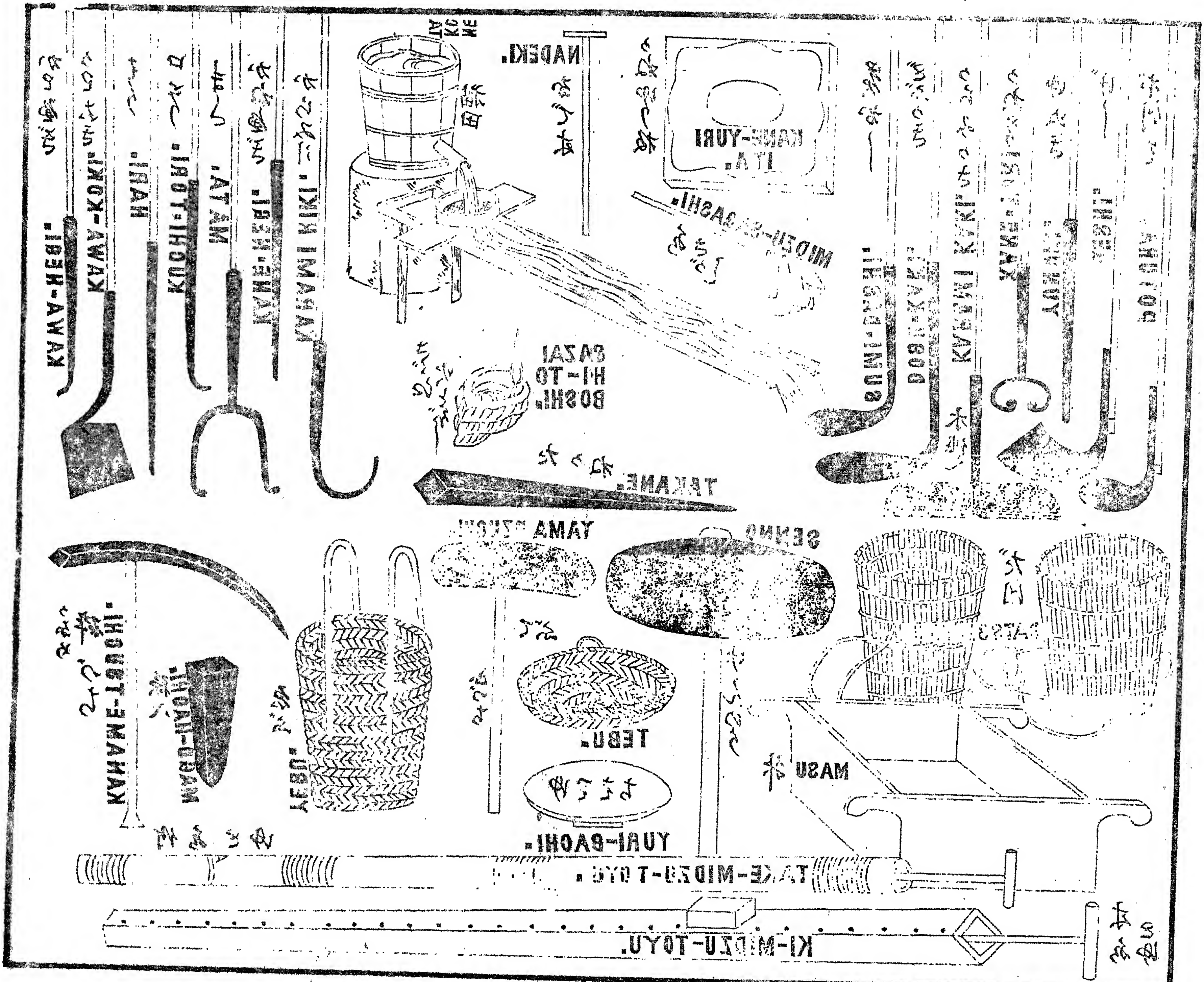


Fig. VIII. **CLEANING AND CRUSHING THE ORE, BEFORE WASHING OR MELTING.**

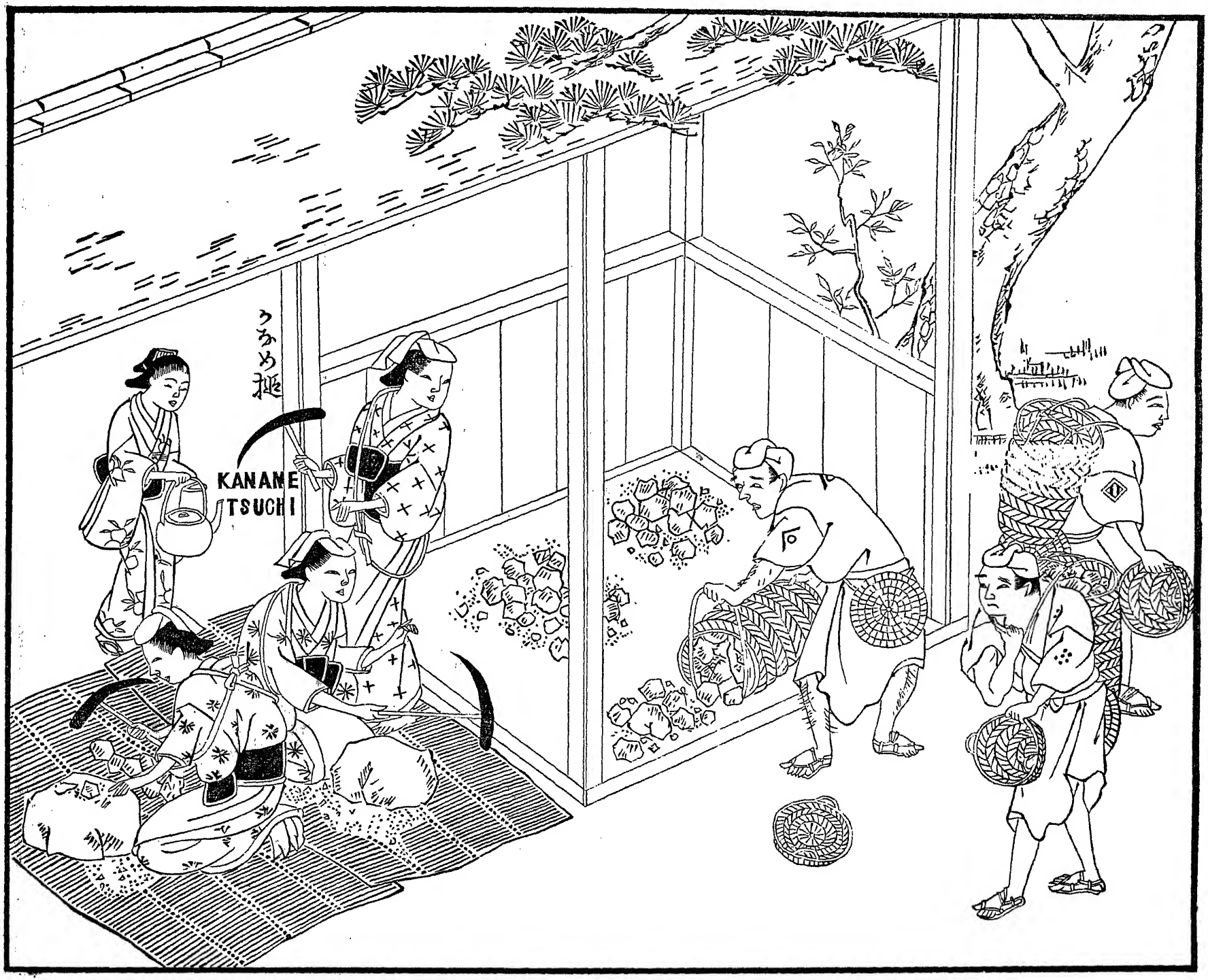
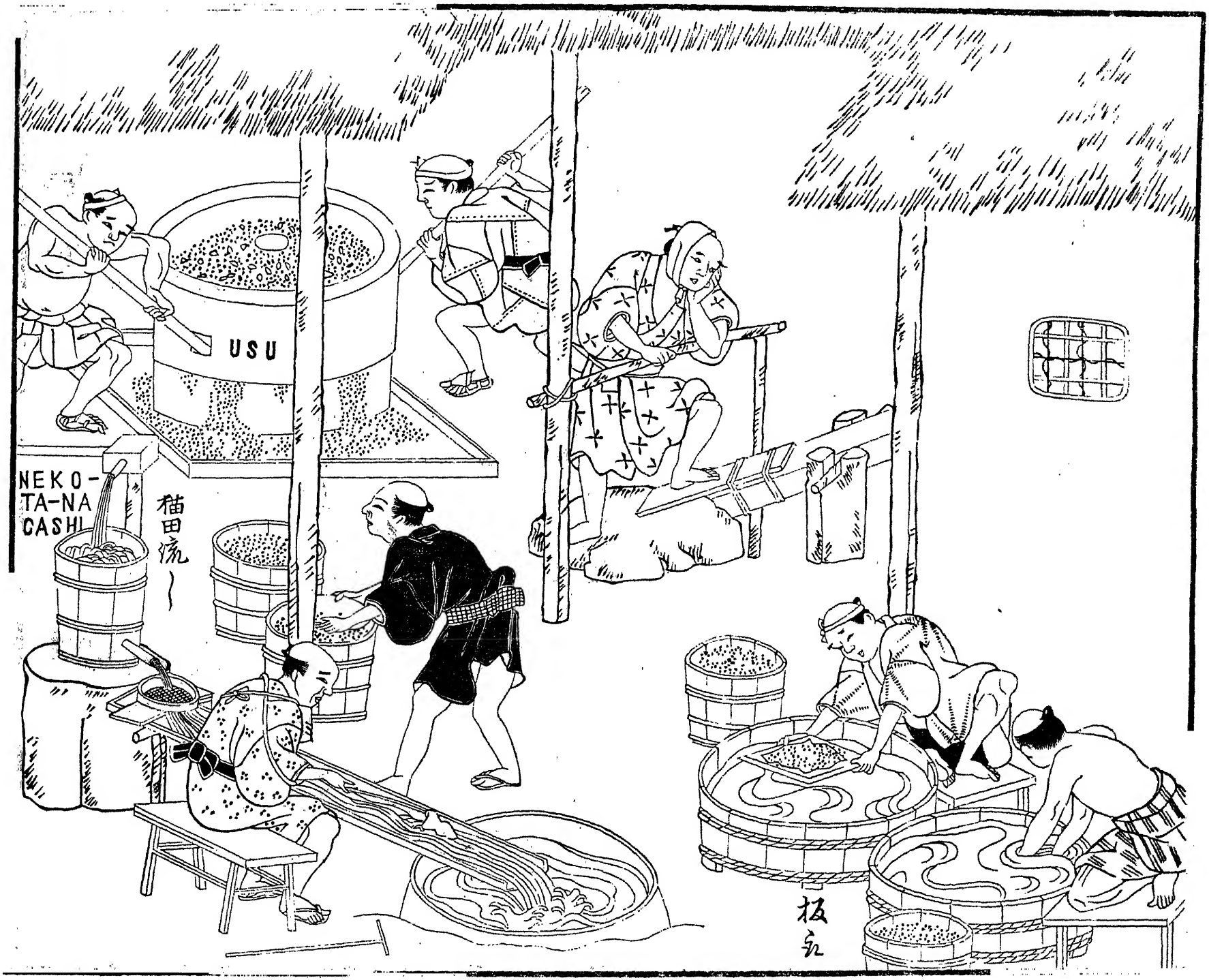


Fig. VIII. CLEANING AND CRUSHING THE ORE, BEFORE WASHING OR MELTING.

Fig. IX. **PULVERIZATION AND WASHING OF GOLD QUARTZ.**



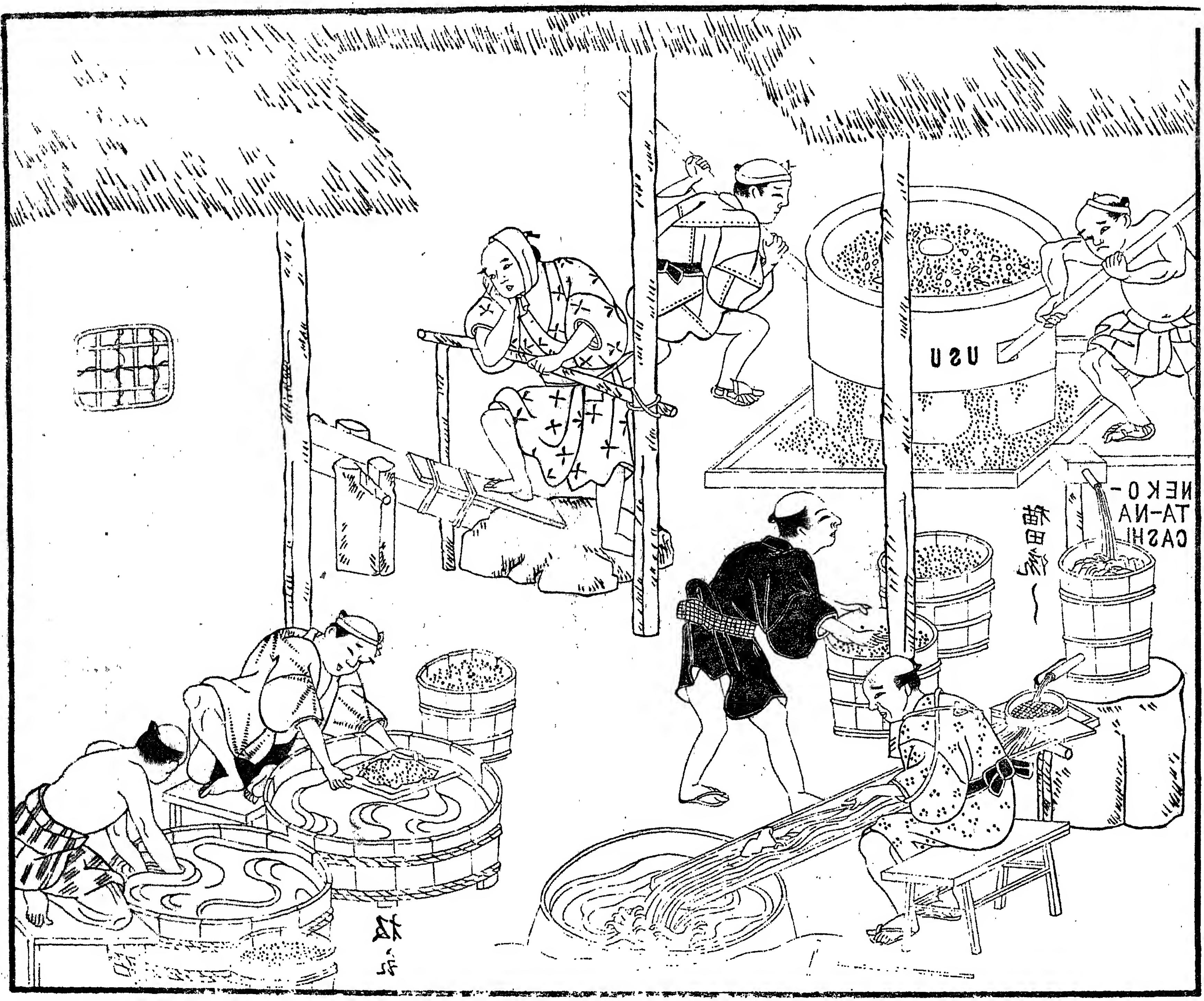


Fig. IX. PULVERIZATION AND WASHING OF GOLD QUARTZ.

Fig. X. WASHING ON MATS, IN A WASHING DITCH, OF IRON-SAND OR GOLD-SAND.

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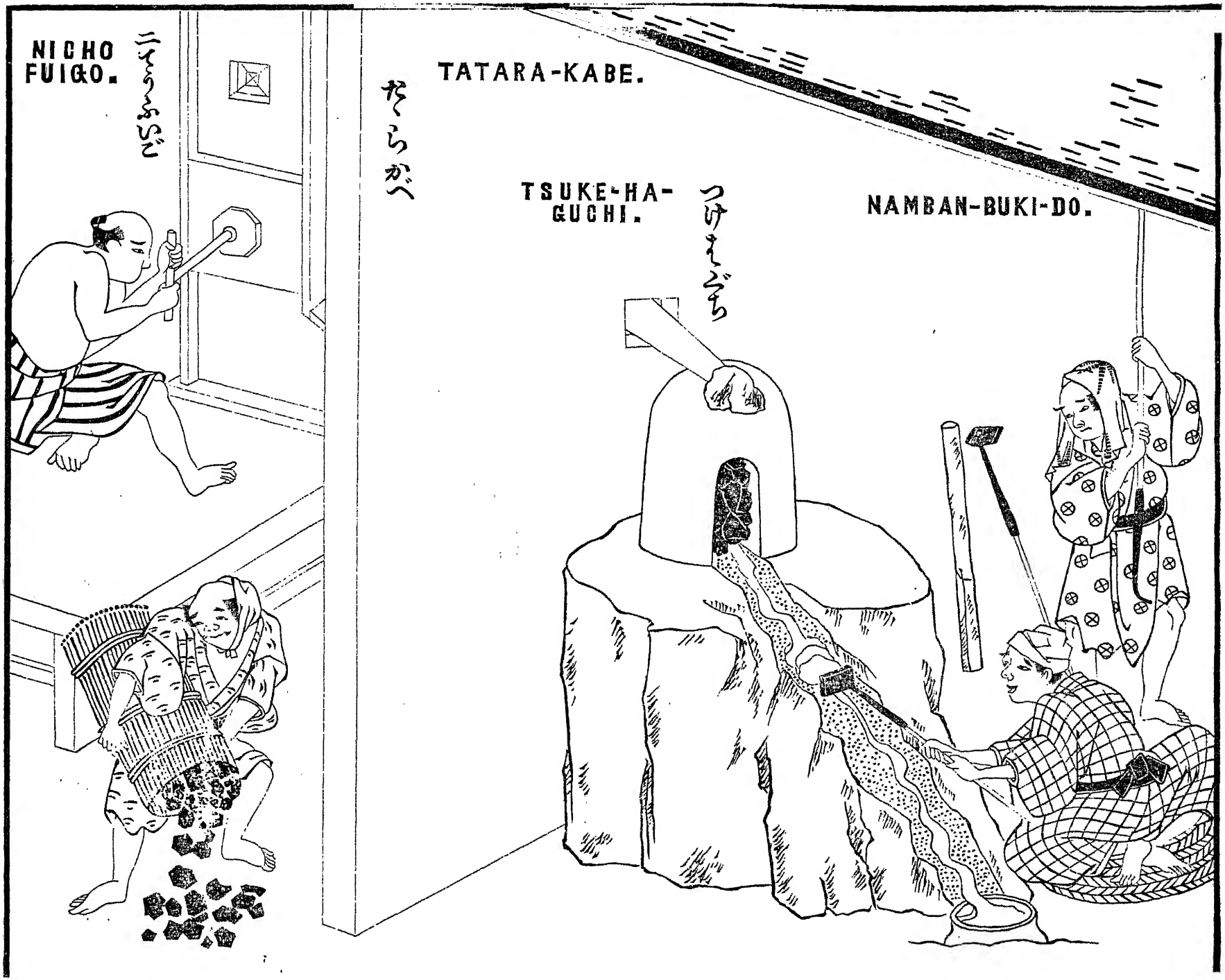
Fig. XI. PROCESS OF LIQUATION FOR THE EXTRACTION OF SILVER OR GOLD OUT OF RAW METALS, BY THE AID OF MELTED LEAD.



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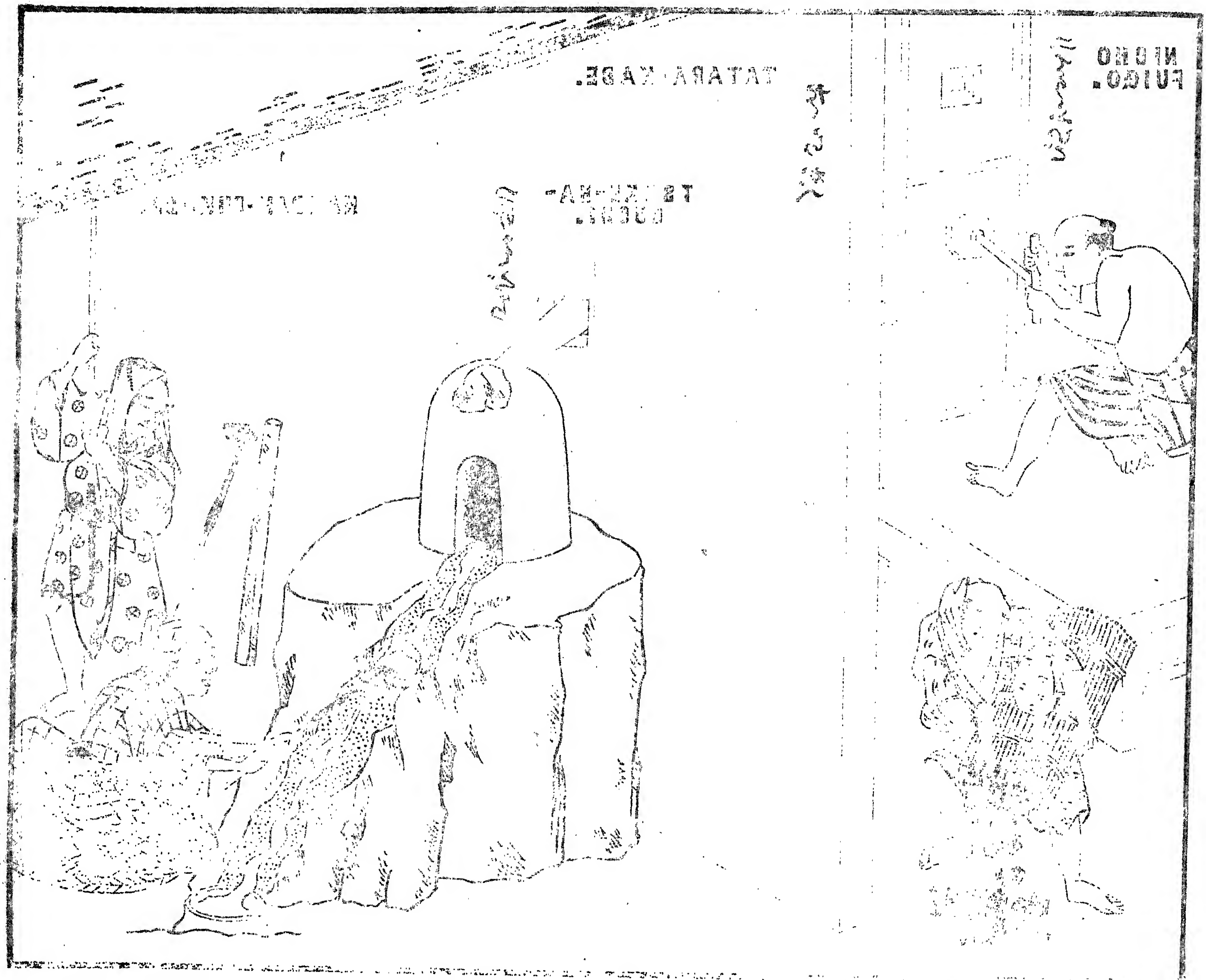
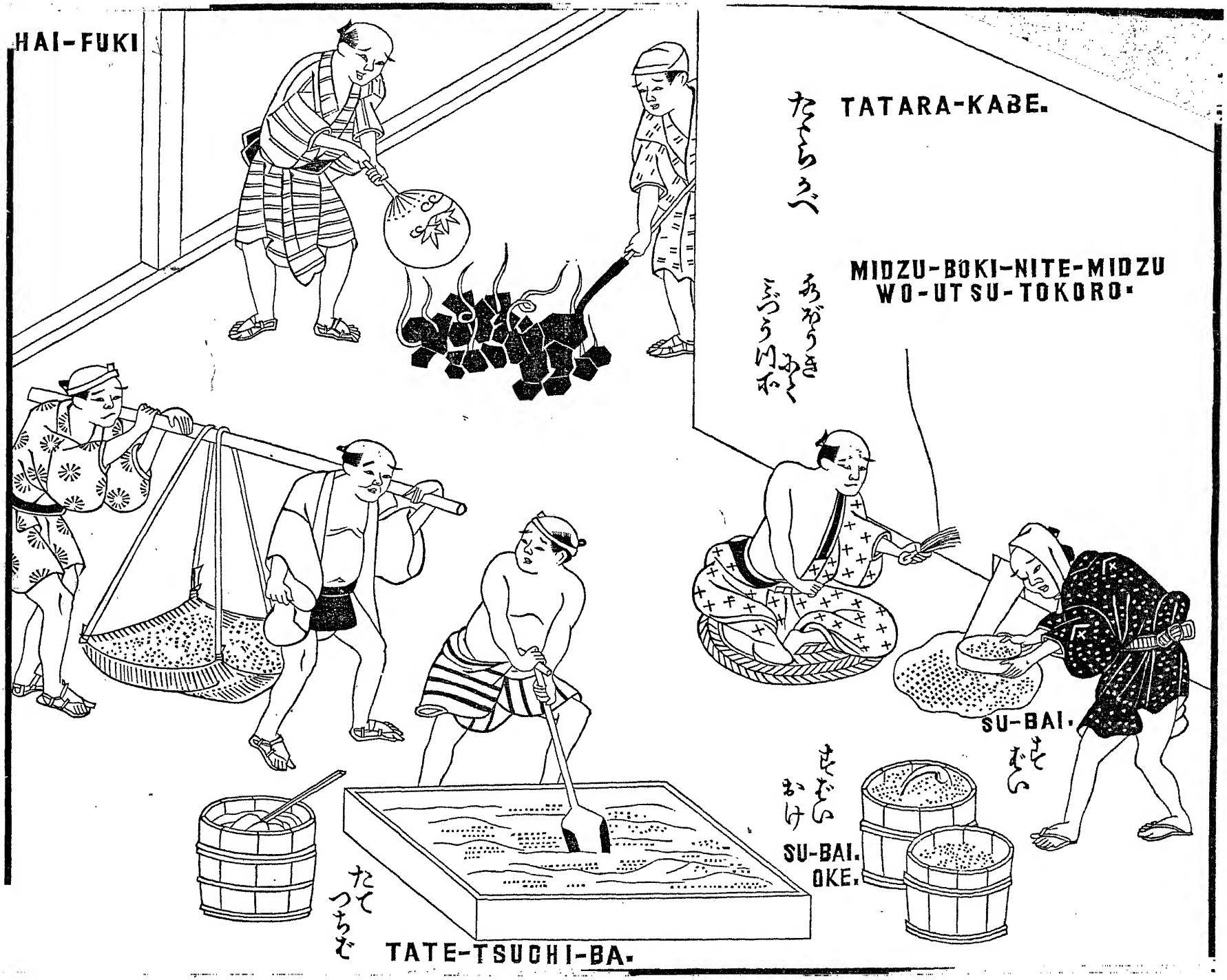


Fig. XII. PREPARING THE BOTTOM OF BUCK-ASHES BEFORE THE CUPELLATION OF ARGENTIFEROUS OR AURIFEROUS LEAD.



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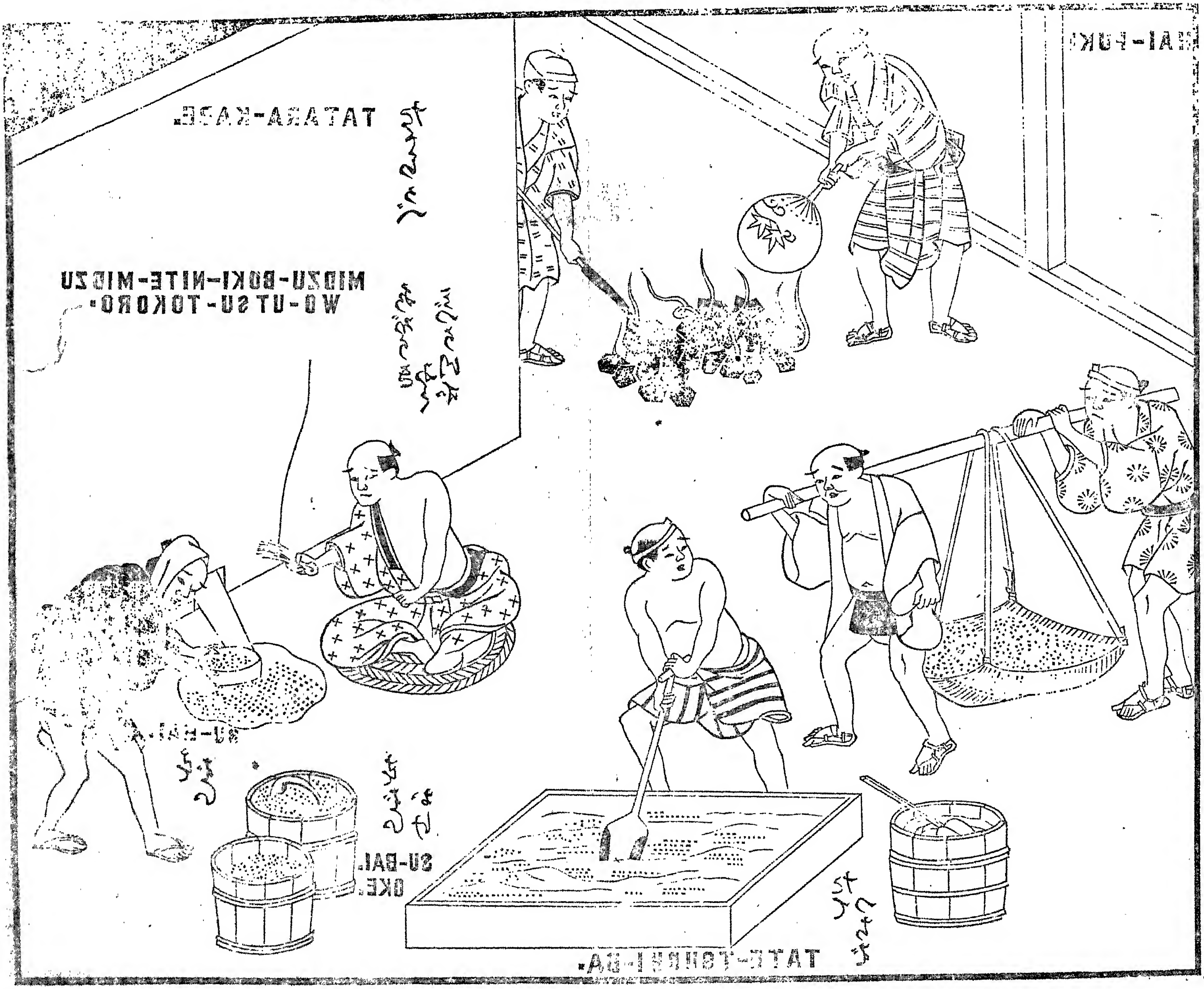

son's paper upon the Bonin Islands had not been presented to be read at this meeting. Professor Syle remarked that it was not respectful to the Council to criticize their method of dealing with papers. They did always the best they could under the circumstances.

Professor Ayrton said that several letters had passed between himself and Mr. Robertson, and that that gentleman expressed his willingness to come to Yedo and read the paper, but that some members of the Council in Yokohama had decided that it should be read there, and that Dr. Geerts' paper should be read in Tokio.

The Chairman thought it was quite competent to the meeting to express its opinion, and to ask why certain papers were kept back and others brought forward. The Rev. W. B. Wright suggested that interesting papers should be read in both places. This was subsequently put as a motion and seconded by Dr. Veeder. Another motion, that the Council be respectfully requested to present papers to the Society in the order in which they were received, was proposed by Professor Grigsby and seconded by Professor Atkinson, but was not carried. Professor Marshall suggested that in the case of papers being not forthcoming, a lecture should be substituted, but as no one seconded this, it was withdrawn. Professor Smith moved that the Council be respectfully requested to furnish a larger proportion of interesting papers upon literary topics. Professor Grigsby heartily seconded the motion, and it was carried.

Dr. Geert's paper upon *Gold* was then read by Professor Ayrton, and a discussion followed in which the Chairman observed that Dr. Geert's paper was much more a literary than a scientific one, and that he had not given any information upon gold mining in Japan. He had spoken of gold washing which was a different process from extracting gold from quartz, which he believed might become a very profitable industry. He visited four gold mines in Satsuma in 1873, and there, although neither gunpowder, pumping nor tunnelling were employed, the operations had been successful and profitable. The methods the Japanese had lately adopted were as good as those in use in Nevada and California. The gold found in the quartz was, like the Nevada gold, mixed with silver, in the proportion of nine parts silver to one of gold. They had recently imported machinery, but they had been able to accomplish much by imperfect imitations. The stamps they had made of wood shod with sheet iron, so light that the crushing was imperfect. Although the paper was not without interest, it was incomplete, and, as regarded gold mining, insufficient.

Professor Atkinson made some remarks upon the question of Japan being a gold country, referring to Mr. Plunkett's late report which showed that in 1874, although the value of the outcome of the gold mines had been 250,000 *yen*, about 200,000 had to be expended in getting the ore, carrying it to the refiners, and that left a balance of only 50,000 *yen*. It could not therefore be rich in gold.

Professor Summers remarked that Mr. Atkinson had omitted the consideration of what the country might produce when machinery camel to be used.

Dr. Veeder added that even the gold washings were sometimes more productive in better hands as was proved by the Chinese working in California. He observed that the mines in California lay in a line parallel to the Pacific Coast, in the lines of volcanoes.

The Chairman said with regard to lines of fracture the rocks in which gold was found in Satsuma were feldspar, and that the veins of quartz ran from E. to W., six to eight inches in width, in mountains lying N. to 12 E.

Professor Syle referred to the model of the Sado mines (presented by Mr. Erasmus Gower some time ago) now in the room. Another mode was in the possession of the Hakubuts kan. They supplemented each other; in some respects this was superior, in others inferior. He asked Mr. Ayrton why there had been some years ago so great a disparity in the value of gold and silver in Japan.

Mr. Ayrton thought that gold had been found in larger quantities.

The Chairman suggested that as only silver coinage had been in use gold had depreciated accordingly.

Mr. Wakayama believed that a much greater difference had been found 200 years ago.

Professor Syle said a *Kobang*, worth $3 here in 1858, had been sold at $5 in Belgium.

Professor Smith asked the Chairman if he could favour the meeting with any information on the gold produce of Yezo from his experience.

The Chairman considered that Mr. Munroe's account was trustworthy, and the only account of that kind of working which was superficial. There were in some places 40 feet of gravel and they ought to go down. Then he expected it would be more satisfactory.

The meeting was then adjourned.

THE BONIN ISLANDS.

BY

RUSSELL ROBERTSON, Esq.

Read before the Asiatic Society of Japan, on the 15th March, 1876.

The Bonin Islands which lie between the parallels of 26.30 and 27.45 North are situated almost due South of Yokohama at a distance of about 500 miles, Port Lloyd situated in Lat. 27.5.35 N. and 142.11.30 East Longitude being distant 516 miles—the longitude of Port Lloyd has been fixed by a later authority at 142.16.30.

The Islands consist of three groups, the Northernmost and Southernmost of which are known respectively as the Parry and Bailey or Coffin groups. The centre group is made up of three Islands: Stapleton to the North, Peel Island to the South and Buckland Island in the centre. This middle group is 9¼ miles in length, 4¼ of which are taken up by Peel Island.

Hillsboro' the largest of the Bailey or Coffin group is 7½ miles long and 1¼ miles broad.

From Japanese records it would appear that these Islands were known to Japan in the year 1593, if not before that, when they were held as a fief by the Daimio Ogasawara Sadayori and communication was maintained with them up to 1624. In Kæmpfer's work the following mention is made of the Islands, "About the year 1675 "the Japanese accidentally discovered a very large island,

"one of their barks having been forced there in a storm "from the Island Hachijo, from which they computed it to "be 300 miles distant towards the East. They met with no "inhabitants, but found it to be a very pleasant and fruitful "country, well supplied with fresh water and furnished with "plenty of plants and trees, particularly the arrack tree, "which however might give room to conjecture that the "Island lay rather to the South of Japan than to the East, "these trees growing only in hot countries. They called "it Bune sima or the Island Bune and because they found "no inhabitants upon it they marked it with the character "of an uninhabited Island. On the shores they found an "incredible quantity of fish and crabs, some of which were "from four to six feet long."

The turtle that abound at the Bonins were probably taken by the Japanese for enormous crabs.

A blank in the history of the Bonin Islands then follows until 1728, when communication was again established by a descendant of Sadayori's, Miyanouchi Sadayori by name, of short duration however, for after a long interval we find no further mention of the Islands in Japanese records until the close of 1861, when Japanese Commissioners were sent to Port Lloyd, the visit resulting in the establishment of a small colony under the governorship of Mr. Obana Sakusuke. The attempt was however a failure. Several of the colonists returned to Japan after a brief stay and the remnant was withdrawn early in 1863.

The Islands known to most of us by name have during the past few years excited not a little curiosity from the reports that have reached us from time to time as to the condition of the settlers there, and from surmises as to what steps might eventually be taken to establish them as the territory of one or other of the countries which it was supposed had claimed them.

In November of last year, 1875, the Japanese steamer *Meiji Maru*, having on board four Japanese officers as Commissioners, proceeded to Port Lloyd, and in the same month and simultaneously with the *Meiji Maru* the

Islands were visited by H. M. S. *Curlew*, Commander Church, R. N. on board of which vessel I was a passenger. The Bonins figure on some charts as the Arzobispo Islands, but again on others the Arzobispo appear as a distinct group. It is contended that the word Bunin is a corruption of the Japanese words *Munin* "*uninhabited*," and this appellation would tend to confirm their first discovery by Japanese. Any way they are known generally as the Bonins, the slip from Bunin to Bonin being easily accounted for, though to Japanese they are more familiar as the Ogasawara-shima, or Ogasawara Islands.

From the name Arzobispo it is not improbable that the Islands were known to the Spaniards long since, the more so that they are not so very far from the Marianas or Ladrones group now settled by the Spaniards and known to navigators early in the 16th century. The object of this paper is not however to settle disputed points about prior occupancy, and I therefore pass on to the time when the Islands became more generally known to the outer world.

In the year 1823 they were visited by an American whale ship the *Transit*, Captain Coffin ; whence we arrive at the name Coffin applied equally with Bailey to the Southern group. It is not clear however that the *Transit* visited either the centre or the Northern group. In 1825 the *Supply*, an English whaler, touched at Port Lloyd and left a record of her visit by nailing a board to a tree, afterwards found there by Captain Beechey R. N. of H. M.'s S. *Blossom* which vessel anchored in Port Lloyd on the 9th June 1827. It is to Captain Beechey that we are indebted for the admirable chart of the harbour of Port Lloyd now in use, and for much of the published information about the Bonins. H. M. S. *Blossom* a sloop carrying 16 guns and a complement of 122 all told had been dispatched from England on the 19th May 1825 with instructions to cooperate with Franklin's and Parry's Arctic Expeditions. Captain Beechey's instructions were that he should be at Behring's Straits in the autumn of 1826, and if he failed to meet

either Franklin or Parry he was to leave Behring Straits in October of the same year, repairing there again in the autumn of the ensuing year 1827—the intervals to be employed in cruising in the Pacific Ocean; at the close of 1827 the *Blossom* was to leave on her return voyage to England.

Captain Beechey, having sailed as above narrated on the 19th May 1825, rounded Cape Horn, and touching at Tahiti and the Sandwich Islands reached Behring's Straits in July 1826. In October the *Blossom*, failing to meet Franklin, left Behring's Straits and proceeded to San Francisco where she anchored on or about the 6th November. On the 28th December 1826 Captain Beechey sailed from San Francisco and again visited the Sandwich Islands, proceeding from there to Canton and Macao at which latter place he arrived on or about April 30th 1827. After a brief stay the *Blossom* again set sail, making for Loochoo, and in due course, some time in May 1827 she anchored off the town of Napha, the capital of those Islands.

From here Captain Beechey took his departure on the 25th May, and shaping his course to the Eastward, he reached on the evening of the 7th June the situation of the Bonin Islands as marked in Arrowsmith's chart, in use at that time. The following day, the 8th, no land was in sight, and Captain Beechey was on the point of giving up the Islands as having no actual existence, when, after a few hours sail to the Eastward, several islands were seen extending in a North and South direction as far as the eye could discern. These were the Bonins. A full account of the *Blossom's* visit is formed in Captain Beechey's narative, published in two volumes.

It will suffice if I narrate here that the *Blossom* anchored in Port Lloyd on the 9th June 1827, having first attempted to fetch the southernmost group, but finding wind and current against the ship and discovering in the nearest land an opening which appeared to give promise of a good harbour, Captain Beechey made for this and

anchored in Port Lloyd to which he gave this name, out of regard to a late Bishop of Oxford.

Captain Beechey was much surprised to find here two Europeans who turned out to have been two of the crew of the English whaler *William*, which vessel had been wrecked in Port Lloyd some eight months previous to the *Blossom's* arrival. The name of one of the men was Wittrein; that of the other is not given.

According to the statement of these men, it appears that after the wreck of the vessel the crew set to work to build a small schooner in order to find their way to Manilla, as the chances of their being picked off from Port Lloyd were somewhat remote; to their surprise, however, a whale-ship, the *Timor*, appeared, and took off the crew of the wrecked vessel with the exception of these two men, Wittrein and his companion.

The *Blossom* remained at Port Lloyd for six days, and the time was fully taken up with surveying the harbour, making excursions in the immediate neighbourhood, and in circumnavigating the Island. To the Island in which Port Lloyd is situated Captain Beechey gave the name of Peel Island, in compliment to Sir Robert Peel, then the Secretary of State for the Home Department; and to the other two of the cluster he gave the names Stapleton and Buckland, the last mentioned after the then Professor of Geology at Oxford. A large bay at the South East angle of Peel Island is named Fitton Bay, after a late President of the Geological Society, whilst a bay to the Southwest angle of Buckland Island is called Walker Bay, after Mr Walker at that time one of the officers of the Hydrographical Department.

To the Southern cluster of Islands Captain Beechey gave the name of Bailey, after a former President of the Astronomical Society, but they are equally known as Coffin Islands, from the name of the master of the American whaler *Transit*, who it was believed was the first to visit them, excepting visits said to have been made by Japanese.

To the Northern group Capt. Beechey gave the name of Parry, after the former Hydrographer to the Admiralty.

Capt. Beechey has pronounced Peel and surrounding Islands to be volcanic in their nature, which is borne out by Commodore Perry of the United States Navy, who when visiting the Islands later in 1853, writes of Port Lloyd as follows! "It would appear that Port Lloyd was "at one time the Crater of an active volcano, from which "the surrounding hills had been thrown up, while the "present entrance to the harbour was formed by a deep "fissure in the side of the cone through which a torrent "of lava had poured into the sea, leaving after its "subsidence a space into which the waters subsequently "were emptied, bringing with them their usual deposits, "which together with the coral formation now forms the "bottom and sides of the harbour."

After leaving Port Lloyd on the 15th June, Captain Beechey made another attempt to reach the southern group, the Bailey or Coffin Islands, but, finding the wind adverse, he bore away to the north and fixed the position of the Parry Group.

This officer's remarks about the Bonins, which appear in full in the work to which I have previously alluded, furnished the only comparatively full information about them up to 1853, when they were visited by Commodore Perry. The narrative of the *Blossom's* cruise is a book seldom met with out here, and I am indebted to Captain St. John of H. M. S. *Sylvia*, for the loan of the work which has thus enabled me to give certain particulars about the Bonins without which this paper would have been incomplete. The sailing directions and notes with regard to the Bonins appearing in that valuable work the "China Pilot" are taken from the narratives of Beechey and Perry.

Before leaving, Captain Beechey affixed to a tree a sheet of copper nailed to a board, and on the sheet of copper the following words were punctured :—

"H. M. S. *Blossom*, Captain Beechey, R.N., took pos-"session of this group of Islands in the name and on

"behalf of His Majesty King George, the 14th June, 1827."

On the occasion of our visit in the *Curlew*, Captain Church and I came across this board in the house of one of the settlers, who parted with it for a trifling consideration. It was in a fair state of preservation, and the inscription as given above could be deciphered after a little trouble; the date appeared to us to be June 17th, but as the *Blossom* left on the 15th, the proper date is probably the 14th.

According to Captain Beechey, in the Japanese accounts of the Bonin Islands as appearing at that time in Mr. Klaproth's "Mémoire sur la Chine," and by Mr. Abel Remusat in the "Journal des Savans" for September, 1817, it is said that the Islands of Bonin sima or Munin sima consist of eighty-nine Islands, of which two are large, four of middling size, four small and the remainder of the group consists of rocks. The two large Islands are said to be inhabited, and temples and villages appear in the Japanese chart published in the "Journal des Savans." Further, it is stated that these Japanese accounts, or I should more correctly say the translations of them, depict the Islands as extremely fertile, producing vegetable and all kinds of grain, sugar, cocoanuts, lofty palm trees, sandal-wood, camphor and other trees.

From this description, Captain Beechey throws doubts upon the Islands visited by him as being identical with the Bonin sima of the Japanese, and to use his own words, says "it may be doubted whether Bonin sima is not an imaginary Island."

In Captain Beechey's opinion the Islands correspond with a group named Yslas del Arzobispo in a work published many years ago in Manila, "Navigacion Especulativa y Pratica," and so much indeed that he has retained on the chart the name Arzobispo which was mentioned at the commencement of this paper, equally with that of the Bonins. It must be remembered, however, that neither the Northern nor Southern cluster, the Parry and Bailey or Coffin groups, were visited by Captain Beechey

(by visiting I mean landed upon), and Japanese have informed me that it was on the Southernmost group Bailey or Coffin, that the early Japanese settlers took up their abode, and where it is believed the remains of a few shrines are still to be found. Making allowance for exaggeration in the description appearing in the early native records, and considering, too, that vegetables, sugar cane, cocoa nuts, pine apples, &c., are now grown on Peel Island, also that among the trees there are palm and sandal wood, it is not unlikely that the Islands visited by the *Blossom* are the veritable Bonins or Munin sima of the Japanese.

We are now to witness the influence of the *Blossom's* visit to these Islands. Before taking leave of this little vessel, with whose name and that of her Commander the Bonins cannot but always be associated, I should record that after leaving these Islands, Captain Beechey, in pursuance of his original instructions to be at Behring's Straits in the autumn of 1827, again made for the Polar Seas, where he arrived in due course; but finding no trace of Franklin at the different rendezvous agreed upon, he reluctantly left for England by way of San Francisco and Cape Horn and anchored at Spithead early in October 1828, after an absence of three years and a half during which the ship had sailed over 73,000 miles.

The Bonins now seem to have attracted attention at the Sandwich Islands, where the news of the *Blossom's* visit was not long in reaching, and from whence a party of colonists sailed for Port Lloyd in 1830, Captain Charlton, then British Consul at the Sandwich Islands, taking a lively interest in the expedition.

The party as far as I can ascertain consisted of the following: Mateo Mazarro said to have been a native of Genoa, but I am inclined to think recognized as a British subject, John Millichamp an Englishman, Nathaniel Savory, born in Massachusetts, United States, Alden B. Chapin, also an American, and Charles Johnson, a Dane. They had with them some Sandwich Island natives as labourers, some live stock and seeds, and, landing at Port

Lloyd, hoisted an English flag which had been given them by Captain Charlton.

Little is now heard of the Bonins until 1842, though doubtless in this long interval of 12 years Port Lloyd was frequently visited by whalers and communication of some kind was thus kept up. In 1842 Mazarro returned to the Sandwich Islands. He described the settlement at Port Lloyd as flourishing, stated that he had hogs and goats in abundance and a few cattle, that he grew Indian corn and many vegetables and had all kinds of tropical fruits. Mazarro returned to Peel Island and eventually died there. His widow, to whom I shall hereafter refer, is still living at Port Lloyd.

I now pass over another interval of seven years until the year 1849 or 1850, when I find that Port Lloyd was visited by the U. S. Surveying Brig *Dolphin*, but she only made a brief stay of four or five days. The next man-of-war to come was H. M. S. *Enterprise*, Captain Collinson, in 1851, which vessel also made but a short stay of about a week. The *Enterprise* was a companion ship with the *Investigator* both vessels being in search of Sir John Franklin's ill-fated expedition. The former had parted company from the *Investigator*, and had probably taken the Bonins on her way up to Kamschatka and the Arctic.

Thomas H. Webb, a British subject who had arrived at Port Lloyd in the American Barque *Japan of* Nantucket in 1849, and where he is still a resident, has a lively recollection of Captain Collinson's visit, and it is to Webb, that I am indebted for much of the information I am able to give in respect to the visits of ships to Port Lloyd from the year 1847 up to the time of the *Curlew's* visit in 1875, excepting of course the visit of Commodore Perry in 1853 of which a full account has been published elsewhere.

In 1852 H. M.'s surveying brig *Serpent* touched at Port Lloyd and remained there some eight days.

We now come to Commodere Perry's visit in 1853, an important one to the settlers on Peel Island.

On the 14th June, 1853, the U. S. men-of-war *Susquehannah* and *Saratoga* dropped anchor in Port Lloyd, having left the port of Napha in the Loochoos on the 9th of the same month. At this time, of the original settlers who came in 1830, and whose names are mentioned at the commencement of this paper, only one, Nathaniel Savory was left, but there were now on Peel Island in all 31 inhabitants, made up as follows ; four English, four American, one Portuguese, the rest being natives from either the Sandwich, the Ladrones, the Caroline or Kingsmill Islands, together with children actually born on the Bonins.

The stay of the *Susquehanna* and *Saratoga* was limited to four days, the ships leaving on the 18th June, and returning to the Loochoos which they reached on the 23rd of the same month, but the time was fully taken up in exploring both Peel and Stapleton Islands.

To the exploration of the first mentioned two parties were told off from the *Susquehanna*, one headed by Mr. Bayard Taylor which took the South, while Dr. Fahs, Assistant-Surgeon of the ship, with his party, went overt he North of the Island. They started early on the morning of the 15th June and did not return to the ship till 10 p.m. of the same night. A full account of this day's proceedings, and indeed a very full account generally of the Bonins is given in chapter X, volume I, of the narrative of Commodore Perry's expedition to China & Japan, published by order of the United States Government.

I do not quote at length from the account therein contained because the work is one of modern date, and is within reach of any one who cares to procure it.

It will be sufficient if I note that not only are the Bonin Islands prominently mentioned in the work above alluded to, but on his return to the States the Commodore placed in the hands of the compiler some further notes on the subject of these Islands and submitted a scheme for their colonization. He appears to have thought that their situation was most advantageous as forming a point on a proposed mail line, which, starting from San Francisco would touch at Honolulu and the Bonins for coal and supplies

and then on to Shanghai as its terminus. The importance that Yokohama was to attain to as a place of call for mail steamers could not then of course be foreseen, considering too that the scheme of a mail line across the Pacific to China, although attracting attention, had not then been developed.

It was during the visit of the *Susquehanna* and *Saratoga* at Port Lloyd that Commodore Perry recommended the settlers to draw up a code or rules of governance for themselves, rather than that they should live under what he described to one of the settlers as *Club Law*. No mention is made of this in his book, but an organization scheme was drawn up. It consisted of three articles and thirteen sections, and was called "organization of the settlers of Peel Island." It provided for the election of a Chief Magistrate and Council of two persons to be elected by and from amongst the settlers, the chief Magistrate and Council to have Power to enact rules and make Regulations for the Government of the Island, such rules and regulations to be binding on the residents provided the concurrence and approval of two-thirds of the whole number of residents had been obtained.

A copy of the organization scheme has been placed at my disposal, and the manner in which it came about was narrated to me on the Island.

Under these rules Nathaniel Savory was elected as Chief Magistrate and James Motley and Thomas H. Webb as Councilmen. The document was signed by Nathaniel Savory, Thomas H. Webb, James Motley, William Gilley, John Brava, Joseph Cullen, George Brava and George Horton.

The rules, however, were never enforced, and the existence of the scheme is now scarcely remembered on Peel Island.

It is of importance that I should follow up the fate of those whose names appear appended to the documents.

Nathaniel Savory died in 1874.

Thomas H. Webb is now living at Port Lloyd.

James Motley died on the Bailey Islands in 1870.

William Gilley was killed at Port Lloyd thirteen years ago, by a man named Jack Spania said to be an Englishman.

John Brava and George Brava are still living on the Bonins.

Joseph Cullen died in Port Lloyd two years ago.

George Horton was removed to Japan in 1862 by the Japanese, and handed over to the U. S. Consul at Kanagawa. Horton died, I believe, shortly after arrival in Japan.

To some of the above names I shall have again occasion to refer.

Before taking leave of Commodore Perry I should state that he left on Peel Island four head of cattle, and on one of the other Islands five Shanghai sheep and six goats.

I enquired at Port Lloyd what had become of this stock, and was told that the cattle had disappeared, having probably been lifted by the crews of the whalers that were in harbour either at that time or that came shortly after Perry's visit. The sheep died, but the goats have multiplied to such an extent that the islands now swarm with them.

Not long after the *Susquehanna* and *Saratoga's* visit the U. S. man-of-war *Plymouth* came to Port Lloyd. Her stay was marked by a most unfortunate accident. One of her cutters with fourteen men had gone outside the harbour in the face of a somewhat rough sea and was never more heard of, there being no doubt that she capsized with all hands, not one of whom ever reached shore.

The place is a very dangerous one for boat work, which should be avoided as much as possible outside the harbour. Much anxiety was felt while I was at Port Lloyd on account of a party of Japanese that had put off one morning from the steamer *Meiji Maru*, and rounding the southern headland of the harbour was lost to sight from the ship. At 6 o'clock p.m. of the same day, and night setting in, there were no signs of the boat; a gun was fired and a rocket sent up from the *Meiji Maru;* but it was not until 10 p.m. of the same evening that some of the missing ones

returned with the report that the boat had been beached the other side of the headland close to the Frenchman Leseur's holding. The boat was eventually recovered, but Leseur said it was a marvel she had ever escaped for she was lifted in on the top of a raging surf right over the rocks and landed close to his own dwelling.

The next visit of men of war after the *Plymouth* was that of four Russian ships which came to Port Lloyd in 1854. This squadron consisted of a frigate, a corvette, a store ship and a small steamer. Their visit was followed by that of the U. S. Frigate *Macedonian*, Captain Abbott, on her way to Manilla. The *Macedonian* had left the U. S. Flag ship *Powhattan* in Yedo Bay. Commodore Perry entrusted to Captain Abbott's care implements of husbandry and seeds to be distributed amongst the settlers, in a letter to one of whom the Commodore writes "it must be understood that the sovereignty of "the Bonin Islands has not yet been settled, and the "interest taken by me in the welfare and prosperity of the "settlement has solely in view the advantages of commerce "generally."

In the ensuing year 1855 the U. S. Man-of-war *Vincennes* visited Port Lloyd and remained 10 days.

In 1861 an attempt to colonize Peel Island was made from Japan, and in November or December of that year a Japanese steamer was despatched to Port Lloyd from Yedo, having on board a Commissioner, subordinate officers and about 100 colonists.

Rules and Regulations for the governance of the settlers, inclusive of foreigners, and harbour Regulations so called were drawn up in English by the Commissioner and his assistants. They appear never to have been enforced, and the present settlers seem for the most part ignorant of their existence. I have however a copy by me from which I extract the following somewhat unintelligible rules.

"Article 3.—It shall be unlawful for any vessel or vessels that may be come into this port to discharge any of the cannon that will hurtful for the fishing.

Article 4.—Any vessel or vessels may come into this port or harbour said the vessel shall to pay to the pilot amount of the established pilotage.

Article 5.—If any person or persons come on shore from any vessel that may be come into this port who shall have pleasure hunting and waste upon the land of any inhabitants and also committed any of such he or they shall be seized and transported to the Captain of their vessel."

Communication would appear to have been kept up with Port Lloyd from Japan from time to time during 1862, for it is recorded that the colonists soon wearying of the enterprise, left Port Lloyd in batches, until early in 1863 the Commissioner himself withdrew, taking with him the few Japanese that had for some fifteen months cast their lot upon the Islands.

The Japanese settlement was situated on the South side of the harbour and one of the houses erected by them still remains. Close to this house a large stone has been erected which records that the Bonins were first visited in the time of Iyeyasu by Ogasawara Sadayori and that in 1593 they received the name of Ogasawara-jima, that they were again visited in 1828, that they are Japanese territory, that they were re-visited in 1861 and that this tablet was erected as a perpetual memorial.

From time to time whalers arriving at Yokohama have been reported as from the Bonins, and in 1872, 1873, and for some time in 1874, a small schooner, the *Tori*, under American colours made trips between Yokohama and Port Lloyd, taking stores and cheap piece-goods from this, and returning with turtle shell, turtle oil, lemons and other Island produce.

In 1874 the U.S. man-of-war *Tuscarora* while engaged on her line of soundings visited Port Lloyd and made a brief stay, and in November 1875, we have the visits of the Japanese steamer *Meiji Maru* and H.M.S. *Curlew*.

Later on, and since my return, the Bonins have, I believe, been visited by the Russian man-of-war *Hydamack* and the German frigate *Hertha*.

I have given prominence to the visits of men-of-war, but it is not to be concluded that the settlers were dependent on these alone for their glimpses of the outer world. Port Lloyd has been the frequent resort of whalers, mostly under American colours, in some instances flying the French or Hawaiian Flags. In one year the arrivals at Port Lloyd have been as many as 15 vessels, but lately the sight of a whaler has been somewhat rare, as may be judged from the fact that last year 1875, but one vessel, a whaler, had touched there prior to the arrival of the *Meiji Maru* and *Curlew*.

In 1849, the year of the rush to California, several vessels, so I was informed by one of the residents, touched at Port Lloyd on their way from China to San Francisco; these ships varied in size from 300 to 1,000 tons, and so far as I can learn must have been coolie passenger ships. That same year, 1849, is also a memorable one in the annals of the settlers, for in the autumn a lorcha and schooner under Danish colours and a cutter with the British flag came to Port Lloyd and made a stay of some two months, during which the vessels were hove down and repaired. They then left in company, but after a few days the lorcha and cutter returned and their crews made a raid on the place, offering no personal violence but carrying off every thing they could lay hands on. The two vessels then quitted Peel Island and were seen no more.

I have thus briefly sketched the history of the Islands down to the time of my visit, but I shall probably in the course of this paper have to refer to past dates in order to complete, as well as can be done in the limits of a paper of this nature, the history of Peel Island and its settlers up to the present time.

H. M. S. *Curlew* anchored in Port Lloyd on the morning of the 26th November, having left Yokohama at 10 a.m., of the 22nd, the voyage being principally made under canvass.

The Japanese steamer *Meiji Maru* with the Japanese Commissioners on board, left Yokohama on Sunday the

21st November at noon, and arrived at Port Lloyd early on Wednesday the 24th.

As we made slowly, in the early morning, for the entrance of the harbour, the approach to which is clearly marked by two conspicuous crags known as "the Paps," the Islands presented a fertile appearance, and the palm trees twisted this way and that by the action of the winds were a conspicuous feature in the vegetation.

The approach to the harbour is marked by bold rocks, and a sheer wall of dark rock rising up at the South side of the harbour dwarfed almost to miniature the *Meiji Maru*, which vessel we descried at anchor well up the harbour. A canoe propelled by three men was noticed about a mile astern of the *Curlew*, but as no signal was made to us Captain Church did not think it advisable to stop, but proceeding on to the anchorage let go close to the Japanese steamer in about 22 fathoms of water. It turned out that the canoe had on board a Frenchman, Leseur by name, the self-constituted pilot of Port Lloyd, whom Captain Peters of the *Meiji Maru* had thoughtfully sent out with a letter to the *Curlew*, in order that Leseur's services might be availed of if required.

The harbour of Port Lloyd open to the south-west is about a mile and half in length, and has a breadth varying from half a mile to a mile.

At the upper end of the harbour, and on its northern shore, a coral reef extends for some distance, terminating in a pinnacle rock. Westward of this, and but a short distance from the beach, there is a depth of ten fathoms, the spot styled by Captain Beechey of the *Blossom* as "ten fathom hole"; from this the water deepens rapidly towards the mouth of the harbour.

The general character of the scenery as observable from the harbour is hilly, with here and there bold crags; the cliff line rising straight from the water's edge, notably so on the Eastern side of the anchorage, while the western and north-western shore is marked by a line of yellow sandy beach to the rear of which the ground is flat for a short distance, backed by hilly slopes and steep

ascents. A fringe of trees hides the level ground and forms a natural boundary between the plots of cultivated land and the sea shore.

The hills are covered with verdure, but the luxuriant and almost tropical nature of the vegetation is not fully realized until after landing.

The ordinary palm and cabbage-palm trees abound on the rising ground which surrounds the anchorage.

A solitary hut at the head of the harbour, in front of which the American flag was hoisted shortly after our arrival, a few canoes drawn up on the beach, and a canoe or two with small white sail flitting across the anchorage, constituted the only outward signs of life visible from the *Curlew*.

It is not within the scope of this paper to give in detail a narrative of what occurred on each day of my stay, which occupied exactly a week, my time, moreover, was for the most part taken up with matters which would have but little general interest; but I will endeavour to give a faithful picture of the condition of the present settlers and to note such matters of interest as will convey to those who are desirous of knowledge on the subject as much information as I myself possess derived from actual observation.

It must be remembered that in 1830 the little colony which in that year first settled at Port Lloyd consisted of Mazarro, Millichamp, Savory, Chapin and Johnson; that of these Millichamp is now living at Guam in the Marianas or Ladrones group, and the rest are dead, Savory having died as recently as the 10th April, 1874, at the age of 79, leaving a widow and six children, now residing on Peel Island. Mrs. Savory was the widow of Mazarro above mentioned, and was married to Savory after Mazarro's death, having also buried another husband in the interval.

In 1853, the time of Commodore Perry's visit, there were residing at Port Lloyd in addition to Sandwich Islanders and natives of other groups, eight foreigners—Savory, Webb, Motley, Gilley, the two Bravas, Cullen

and Horton. What befell the majority of these, has before been stated. These with the other Islanders made up in 1853 a resident population of thirty-one.

The settlers now number sixty-nine, of whom sixty-six reside on Peel Island, and three on the Bailey or Coffin group, of these thirty-seven are males and thirty-two females, and out of the whole number about twenty are children whose ages vary from one to fifteen. Amongst the present settlers there can only be said to be five whites, namely, Thomas H. Webb, an Englishman born in Wallington, Surrey; Leseur a Frenchman who hails from Brittany; Allen a German who comes from Bremen; Rose, about whose nationality I am uncertain, some calling him a German others a Dutchman; and John Brava whose real name is Gonsalves, a Portuguese, born in the Island of Brava, one of the Azores.

Of these John Brava, born in 1811, and consequently now 65 years of age, was the first to come to Port Lloyd where he arrived in 1831 in the British whaler *Partridge*. He remembers Millichamp, Savory and Mazarro being there when he came, as also another foreigner, probably either Chapin or Johnson, whose name, however, he has forgotten. He married at Port Lloyd a Sandwich Island woman, since dead, by whom he had two sons George and Andrew Brava, the latter of whom is dead, as is also his wife; two of his children, however, Francis and Lucy Brava are still living. The other son, George Brava, a man now close on 40 years of age, lives close by his father; he married a daughter of Savory's, who died leaving three children, Jose, Rosa, and Andrew Brava now living with their father.

Thomas H. Webb came, as I think I have before mentioned, to Port Lloyd in the American Barque *Japan*, of Nantucket, some time in 1847, and has thus been nearly thirty years a resident on Peel Island. He married the daughter of an Englishman—Robinson by name—she is living with him now and they have a family of eight children.

George Robinson, about whose ultimate fate there is

much uncertainty, arrived at Port Lloyd in the whaler *Howard* some time in 1849 and took up his residence with Webb, whose home was at that time shared by a man named Gilley (afterwards murdered). Robinson did not remain long at Port Lloyd but removed to Hillsboro' Island, the most important of the Bailey Group, where he cleared and planted out a considerable portion of ground. After a residence of a few years he left with his family for Guam and Seypan and in his absence Motley, of whom mention has before been made, went and occupied his clearing on Hillsboro' Island.

Robinson eventually returned and appears to have arranged amicably with Motley for a joint occupation of the clearing. Robinson on his return had brought with him some natives from the Kingsmill Group and discontent soon manifested itself amongst them, fomented, so it is said, by a woman named Kitty in the employ of Motley. This appears to have engendered a quarrel between Robinson and Motley, for they separated, the Islanders above mentioned leaving Robinson and taking service with Motley. An Englishman, known as Bob, who had run away from a whaler and found shelter with Motley, left the latter and went over to Robinson. At this time Robinson's family consisted of his sons John, Henry and Charles, and his daughters Eliza, Caroline and Susan. There was living with him as nurse to the children a woman, Zipher by name, a native of Raven Island.

Notwithstanding the separation of Robinson and Motley, matters appear to have gone from bad to worse, and scenes of bloodshed ensued, over which I will not linger. It is sufficient to say that one morning, (the event occurred some time in 1861) an attack is said to have been made by the Kingsmill Islanders on the elder Robinson, who with his children John, Henry and Eliza fled in one direction, his daughter Caroline, then a girl of 19, taking with her the younger sister Susan and her brother Charles, flying in another. In the fight that ensued the man Bob was killed, whether by or at the instigation of Motley is not accurately known. Motley has since died

and is buried on Hillsboro' Island. His name will be remembered as one of those appended to the organization scheme.

It is said that George Robinson and the children with him were picked off by a passing whaler, the *Montreal*, Captain Sole; the rest of his family fled to the opposite side of the Island, and making their way to the sea-shore, subsisted there for a period of eleven months living on shell-fish and berries, until attracted by the smoke of a fire, the captain of a passing whaler the *E. L. B. Jenny*, hove to off the land, and, going ashore in a boat, found the two girls Caroline and Susan Robinson with their brother Charles and the nurse Zipher in a most pitiable condition, as may well be imagined. Taking them on board, he proceeded to Port Lloyd, close by, where the family were sheltered by Webb, who subsequently married the girl Caroline, Susan later on becoming the wife of a man named Pease, said to have been an American, and whose disappearance at Port Lloyd in the autumn of 1874 is generally well known. Mrs. Pease, Charles Robinson and the woman Zipher are now living on Peel Island.

John Robinson is reported to be living at the Sandwich Islands, which would go to confirm the supposition that with his father they had made good their escape from Hillsboro'. The woman Kitty is still living at the Bailey group, with the man Rose and a Kanaka boy, making up the three residents on those Islands.

The next to arrive at Port Lloyd is the Frenchman Leseur, better known on the Islands as Louis. He came in the Hawaiian whaler *Wyola* in 1862 or 1863, but he had made several visits to the Islands before that in different whalers. In one of the years, however, above-mentioned he took up his residence at Port Lloyd where he has since, with the exception of a visit to Guam, continued to dwell. He is a stout hearty-looking Frenchman of about 55 years of age, speaking English remarkably well—his present wife, Pidear by name, is a native of Grigan, one of the Ladrones group, and is the

widow of a man known as John Marquèse, a native of the Marquesas.

By a former wife, who is buried at Port Lloyd, Leseur has three children, Albert, Lousia, and Phillis, who are still living. I may here mention that it was at Leseur's house we found the copper plate and board put up by Captain Beechey in 1827. Leseur said he had found it in an outhouse on the clearing he now occupies.

We next come to the German Allen who arrived with Leseur in 1862 or 1863. He appears to be a man of fifty and upwards and has taken to wife a Sandwich Island woman, Poconoi by name. They live on Peel Island about a couple of miles from Port Lloyd and midway between the dwellings of Leseur and Webb.

As regards the man Rose, now living on the Bailey Islands, it is uncertain when he actually came to reside there. All that is known of him at Port Lloyd is that he made his first appearance there in the French whaler *Gustav* in 1852. He was left there sick, but shipped again, and made his appearance at Port Lloyd from time to time in successive whalers. He was eventually found residing on Hillsboro' Island, but the precise date of his arrival there, or indeed how he got there at all, is not known.

The settlers other than those of whom I have made particular mention consist of men and women from the Sandwich Islands; from Grigan, or Agrigan, as it is sometimes called; from the Caroline Islands; and from the Gilbert or Kingsmill groups,—there is also one man from Bermuda, Robert Myers by name, claiming to be a British subject; a Manilla man named Sino, and two Japanese women, the wives respectively of Sino and Myers. Of the 66 settlers now on the Bonins 35 have been born on the Islands. The nomenclature is curious, for I found in the list of residents that I procured when at Port Lloyd the following names, Thomas Tewcrab, and his wife Bosan, Charley Papa, Friday, Bill Boles, Samuel Tinpot, Zipher, Hannah

Poconoi, Samuel Tinpot, Pidear, Mrs. Tinaree, and Mrs. Fanny and Mrs. Betty.

Miscegenation has brought about rather curious results. In the male children the white parentage is very distinct: light olive complexion, dark eyes and clear cut features, in the females the Micronesian blood is unmistakeable, and I found in many cases the flat face and coarse features of the Pacific Islanders—on the other hand, in some cases the women are in appearance very closely akin to the Hindostanee.

The men dress for the most part simply in shirt and trousers with broad brimmed Panama hat, a cotton shirt being replaced by a flannel one in the winter months. The women in print gowns with a bright colored kerchief on the head.

The two Japanese women above referred to were taken from Yokohama in the schooner *Tori* some time during 1873; four or five others also were passengers, but they elected to return to Yokohama.

Having thus conveyed a general idea of how the resident population is made up, I procced to describe their dwellings, their occupation and mode of life.

Each family has its holding or clearing of cultivated land close to which the dwelling and outhouses are erected, these are situated for the most part round the harbour, but screened from view by a fringing of hummock trees.

Webb, Allen and Leseur have their clearings away from Port Lloyd to the south and west of the harbour in each case close to the sea.

To the holdings are given distinct appellations. Thus, commencing from the left hand, or north western side of the harbour, there is *Yellow Beach* on which the Bravas, father and son, the Tewcrabs, a family numbering some 15 members, and Charles Robinson have their clearings; continuing along the shore a site known as the *Cove* opposite ten fathom hole is reached; then a spot known as *Jackson*, unoccupied. From this it is but a step to the *Head of the harbour*, as the location of the Savorys is

called, and continuing along the eastern and southern shore, we come to *Bull Beach*, the dwelling of the Manilla man Sino and his Japanese wife, and but a short distance beyond this the site known as *Aki*, the present residence of the widow Pease and former site of the Japanese colony established at the close of 1861 and broken up early in 1863.

Leaving the harbour and coasting round the sea shore, but bearing to the south, Leseur's place of residence known as *Blossom* or *Clarkson's* village is reached; further on is *Poconoi* the dwelling of William Allen, and beyond this *Little Liver* where Webb and his family reside; to each of these a land track leads, starting from *Aki*, but the road is a rough one, and they are more easily reached by canoe, provided the weather suits.

The dwelling houses resemble one another closely and to describe one is to describe all. They consist of two rooms, constructed with wooden uprights, and each has a solid wood flooring; the sides and roof are thatched with the leaf of the cabbage palm neatly secured to the rafters with thin wooden slips. Kitchens and outhouses are all separate from the dwelling. Of furniture there is of course not a very large display; a rough deal table, a few chairs and a seaman's chest go to make up the furniture of one room, while the bedroom opening out from it is supplied with a plain wooden bedstead.

Each cabin, for so it may be called, is supplied with a clock—a few cheap and highly colored prints adorn the walls and from the ceiling hang rifle and fowling piece. A few shelves with plates and crockery-ware neatly arranged complete all that is seen in the interior or these dwellings. Everything is scrupulously clean, from floor and woodwork to linen and crockery.

Of books, with the exception of a few, I saw in Webb's house, there are none, and, Webb excepted, no one on the Islands can either read or write.

In the cultivated ground which surrounds each dwelling are seen patches of garden vegetables, sweet potatoes, pumpkins, and wherever there is a little running water,

taro, from which the article of diet so well known in the Sandwich Islands under the name of *poi* is made.

The dwellings are all with but one exception, that of the widow Pease at *Aki*, situated on low ground and to the back of the cabins the sloping ground is in some cases laid out with Sugar cane, Maize, and a few Cocoa-nut plantations. Plaintains thrive and are grown close to the homesteads, and lemons of excellent quality abound throughout the Island.

Pigs, geese, ducks, and fowls are kept by the settlers, and appear to thrive well. What with wild goats, wild and tame pigs, poultry, fruit and vegetable produce afforded by the shore and excellent fish and turtle from the harbour, the settlers are not so badly off for food. It happens, however, at times that violent hurricances play sad havoc with the vegetation and now and then there is actual distress for food, one family that I came across being reduced to Indian-corn meal alone for diet.

The occupation of the settlers can very easily be imagined. Rising at dawn, work is done either in the garden or about the house until breakfast, which is taken about eight a.m. The meal varies according to season, and consists of whatever the family may have at hand either fresh or salted turtle, fish, corn meal, *taro* or vegetables. After breakfast work is resumed; one will go after turtle, which, when in season in April, May and June are turned over in great numbers—one man securing perhaps 50 a day. Another will go fishing, or perhaps, taking his gun, look after a wild goat or pig; firewood has, to be cut or a neighbour wants a helping hand to repair his house or erect a new one.

The evening meal is taken shortly before dusk, it is probably the same in materials as the breakfast, perhaps with the addition of goat's flesh or pork. And after supper to bed—and so on from day to day, an existence varied only by the occasional visit of a whaler, now apparently very rare. In addition to the products of the Island already noted, I should mention that arrowroot of

very good quality is grown, and that the soil seems eminently adapted both for this and for tapioca.

Of running water there seems no lack.

The settlers have of course an eye to trade, though they seem more inclined to barter than to accept money; and naturally so, for money is of little or no use amongst themselves and they can only hope to pass it off with the next in-coming whaler unless perhaps it is hoarded.

Their wants are notably piece-goods of any description, provided they are of light texture and suitable for clothing, stores, salt (much used in salting down turtle for winter consumption) soap, tobacco, hardware, nails, knives, tools of different kinds and ammunition. Against these they are ready to barter turtle, turtle-shell, turtle-oil, bananas, lemons, poultry and garden produce. If, however, the purchaser prefers to pay in cash the following are the island rates: Turtle, each $2; turtle oil $10, $15 and $20 a barrel; turtle shell, 50 cents per pound; lemons, $2 a hundred.

It can be understood, however, that the wants of the settlers, which are in themselves comparatively few, are easily supplied to so limited a population. The *Meiji Maru* took down presents in the shape of blankets, piece-goods, tea, spirits, cigars and a few miscellaneous articles, and Captain Church of the *Curlew*, not unmindful of the settlers' wants, made up for each of those who required them a packet containing shirts, flannel, shoes, knives, soap and other useful ships' stores.

As I personally visited the dwelling of each settler, and as in so doing I had to cross the southern portion of the Island in order to visit Leseur, Allen and Webb at their respective holdings, I was enabled to get a very good idea of the character of the scenery, the vegetation and the general resources of the Island. It is not until landing that the more tropical nature of the vegetation is apparent. Palms, what appeared to be a species of wild pine-apple, and luxuriant ferns grow in rich profusion: the hill sides are clothed with verdure and the valleys are filled

with a description of wild bean, with here and there patches of *taro*.

The following are the principal trees and plants. I give their names as known among the settlers,—in some cases probably Hawaiian appellations have been adopted.

Tremana; a beautiful wood and largely used by the settlers. Whalers are in the habit of taking away quantities of this wood, which is sold to them at twenty-five cents a foot, and on one occasion a schooner took away from the island a full cargo of it.

Mulberry; used on the Bonins for the uprights of houses and generally for building purposes.

Cedar, so called, furnishes a beautiful wood of which the floorings of the dwellings are nearly all made.

Tea tree and *poison* wood tree; used for making the hulls of canoes.

Spruce; used only for fuel.

Rose wood tree; in use for binding down the thatch of the dwellings.

Shaddock; the wood of which is used for roofing purposes.

Yellow wood; no particular use.

Hake wood and white oak; both employed in dwellings.

Lohala tree. Mats are made of the leaves and fibre of this tree—the fruit makes a good food for pigs.

Milk wood, *red iron* wood and *white iron* wood; in use for building purposes.

Black iron wood; used only for fuel.

Soft Hao wood; of which the hulls and canoes are made.

Swamp *hao* wood and mountain *hao* wood; used for making the arms of canoes with which the outrigger is attached to the hull.

Narrow leaf *hao* tree; the wood of this is used for the handles of hatchets and for garden implements.

Kehop tree or shrub; a beautiful plant resembling an aloe and bearing a sweetly scented flower; the leaves of this are much in request by the settlers as they are supposed to contain certain healing qualities; they are

made soft by heating before a fire and are then applied to bruises and sores.

In addition to the above mentioned and those already noted there are on the Islands, wild *plum* and *cherry*, *orange*, *laurel*, *juniper* and *box wood* tree, *sandal* wood, *marmottao*, wild *cactus*, *curry plant*, *wild sage* and *celery*. *Mosses*, *lichens* and various kinds of parasitic plants abound.

Of minerals upon the Islands none are known to the settlers, unless I except iron *pyrites*, specimens of which are found on Peel Island.

The shores are covered with coral, and these, together with the reefs, are strewn with shells, some of which are very beautiful.

Earthquake shocks and tidal waves are frequent, the peculiarity of the latter being that no bore rushes up the harbour, but the water suddenly rises just in the manner, as described to me by a settler, as water is raised in a bowl by inserting an inverted tumbler, when the water has attained a certain height, it as suddenly recedes. The climate is more tropical than temperate. At the time of our visit, during the latter end of November, the thermometer at noon stood at 70° and 75°, and after Yokohama seemed oppressively warm. Sickness is almost unknown amongst the settlers, the only thing they complain of is that on the changes of season from heat to cold, and from cold to heat, they are liable to chills resulting in violent colds.

I noticed no signs of intemperance, nor did I see in any of the houses either beer, wine or spirits.

To those who visited us on board the *Curlew* beer seemed to recommend itself most, but only to the older men, the younger refusing to take anything but water with their meals when entertained on board the ship. The use of tobacco is general.

I have before remarked that on our arrival at Port Lloyd the American flag was run up close to a cabin at the top of the harbour. This turned out to be on the holding owned by the widow Savory and her family

though the dwelling itself is obscured from the anchorage by trees.

I had a long chat with this old lady, who received Capt. Church and myself surrounded by her family, one or two of the other settlers also being present.

She explained that the hoisting of the flag was out of compliment to us, and that one of her husband's dying wishes had been that the flag should be so displayed whenever a vessel arrived or on any exceptional occasion.

I asked Mrs. Savory if she had any ideas on the subject of protection by any particular Power, but the family all gravely shook their heads at this, and said they wanted to be regarded as Bonin Islanders, by which I understood them to mean that they wished to be left alone in undisturbed possession of their holdings, and the less that was said about nationality or protection of any kind the better. Close to the house is Savory's grave, and indeed in most of the enclosures the resting places of the dead are conspicuous features surrounded with neat palisades and in some cases a headstone recording in English the name and date of death of the deceased. While on this subject I should not omit to record that one of the settlers told me he had, when digging near the shore a few years back, come across the skeleton of a child apparently about ten years of age; the bones fell to pieces at the touch and on exposure to the air, from which it is conceived that they had been there many years.

I have not before noted that English is spoken by all the settlers, unless I except some half dozen from the Kingsmill group, who speak their own language.

There is however no attempt at education on the Islands, nor is there indeed any one there who could improve this state of things, Webb being the only one who reads or writes, and this indifferently well. Religion has with perhaps the exception of Webb, no name amongst them; the marriage and burial services are, however, always read by Webb when occasion requires.

When speaking to Mrs. Savory about her husband's death, I asked if his end had been peaceful. She replied

"quite so; that he had given certain directions with great clearness." But when following up my question by asking if he had expressed himself in any way about a future state, the question did not seem to be understood and was received with blank looks. Mrs. Savory rather amused me when in reply to a question I put as to what possible charm there could be in such an existence as she and her family were leading she replied, "Well, I guess we pay no taxes here."

From Mrs. Savory, her son Horace, a young fellow of two or three and twenty, from Webb, Leseur, Charles Robinson and the Bravas, Captain Church and I received much kindness and attention.

It now only remains for me to make some concluding remarks. Popular rumour had ascribed to the Bonins a colony of semi-savages, murdering one another and altogether leading a barbarous existence. I found a small colony of settlers, living to all outward appearances in decency and order, cleanly in their attire, civil in their address and comfortable in their homes. Such is the bright side.

The dark picture is the utter apathy of the settlers; their indifference to anything outside of what goes to satisfy their immediate wants; their suspicion in some cases of one another. No religion, no education, old men and women hastening to their graves without the one, children growing up without the other—and there is a darker picture than this. This paper records the fact of two men Gilley and Bob (so called) having fallen by the hand of their neighbours. On the 9th October, 1874, Benjamin Pease, a resident at Port Lloyd, disappeared, and it is believed met with a violent death, while on the 11th June 1875 a negro, Spenser by name, strongly suspected of having been Pease's assassin also disappeared, receiving his death blow it is said at the hands of one of the residents. I was informed by a settler that during his stay on the Bonins, now extending over 25 years, no less than 11 men had met with violent deaths. I would not have it assumed, however, that these tragedies are to be

ascribed altogether to the *bona fide* resident population, if indeed, the word population can be ascribed to such a little band.

It must be remembered that the component parts of the population are a few old residents, a few comparatively new, some born on the Islands and now getting on in years, runaways from whalers and men perhaps purposely left behind, and these latter we may be sure not the most orderly of the crew.

I trust that if communication comes to be established with these islands with anything like regularity that the claims of the settlers on the sympathies of the foreign communities of Yokohama and Yedo will not be overlooked, and that an attempt at ameliorating their condition will be made from one or both these settlements if not indeed generally from the open ports in Japan. I can vouch for it that kindly sympathy expressed either in word or deed will not be inappreciated there, and that in spite of many drawbacks, there are as warm hearts on the Bonins as any that beat amongst ourselves.

A General Meeting of the above Society was held in the Grand Hotel on Wednesday, the 15th instant, the President, Dr. S. R. Brown, in the Chair. The attendance of members and friends was unusually large. The minutes of last meeting were read and approved.

Mr. Russell Robertson then proceeded to read his interesting paper on "The Bonin Islands."

On its conclusion Dr. Brown remarked that he was sure it would not be regarded as a mere formality, when he said that the Asiatic Society was much indebted to Mr. Robertson for the elaborate and interesting account he had given of the Bonin Islands. That group so near to us, and yet out of the usual track of vessels that traverse the Pacific has long been known to navigators and others, but the reports respecting the islands have been so fragmentary and scattered, that it was difficult, if not impossible, to form a correct conception of their physical characteristics, or of the condition of their inhabitants. Mr. Robertson has given us, what must have cost him much painstaking, an almost exhaustive description of those islands, as the result of his research among books of voyages and his own careful personal observations, gathering up into a con-

nected whole all that is known of their past history and present state. The variety of nationalities among the 69 residents there shows that whalers have most frequently visited those islands. That little community is composed of persons from the United States, Great Britain, France, Germany, Portugal, the Sandwich Islands, the Ladrones, the Kingsmill and other groups in the Pacific, as well as Japanese and natives of the Bonin Islands.

The Japanese Government not long ago made an abortive attempt to colonize those islands, and perhaps still claims sovereignty over them, but the people on the Islands, it appears, prefer to be left to themselves.

Mr. Robertson's concluding remarks respecting the social, intellectual and moral condition of those people deserve consideration. Webb, the only man among them who can read and write, must soon pass away, and there is none to fill his place in burying their dead or reading the marriage service at their weddings. It is pitiful to think of the deeper ignorance and degradation into which those people must of necessity relapse, unless some outside influence intervenes to prevent it. Mr. Robertson's suggestion that the foreigners in Japan might do something to improve their condition and prospects, commends itself to all hearts that have a fellow-feeling for their kind.

Dr. Brown referred to George Horton whose name is mentioned as one of the men living there a few years ago. He said he knew him, that Horton's history served to show through what checquered fortunes obscure individuals often pass. He was left in the Bonin Islands as an invalid, at his own request, by Commodore Perry in 1853 or 1854. In 1862 he was brought to Yokohama under arrest, in a Japanese whaling vessel, charged with having made a piratical attempt upon that vessel. Horton was about 80 years old at the time. Being brought before the United States Minister for trial, the facts elicited were these. While the Japanese vessel lay at Port Lloyd, Horton one day was out shooting at a mark with an old pistol, when a man of the island who had been out on a cruise in the whaler, asked him to go on board with him and help him to bring off his chest, as he wished to leave the ship. Horton consented and when the boat drew up along side the ship, threw his rusty old weapon down in the stern sheets of the boat, and went up on deck. Here some wordy altercation about the removal of the chest, between its owner and the Captain, resulted in Horton's being accused of piratical designs against the ship, and he was tied up with ropes, and made fast to a spar. In this condition he was brought to Yokohama and handed over to the United States authorities for trial. A mere look at the shaky decrepit old man was enough to disprove the charge and he was accordingly acquitted. The decision of the Court was that Horton should either be replaced in possession of his clearing and house on the islands, or that $1000 should be deposited with the American Consul for his support here. The latter altern-

ative was preferred by the Captain of the ship. Horton was a native of Boston in England, had at first owned and commanded a vessel, had been a seaman in the British navy for twenty-five years, was in the battle of Copenhagen, served under Nelson in the battle of the Nile, and finally had served in the U. S. Navy eighteen years when left on the Bonin Islands. He survived his removal to Yokohama by about two years, and his remains lie interred in the cemetery here.

ASIATIC SOCIETY OF JAPAN.

A General Meeting of the Asiatic Society was held in Tokio on Wednesday, the 19th instant, Dr. Faulds in the chair. Notes for a paper "On the Musical Notation of the Chinese with its counterpart in Japan" were read and enlarged on by the Revd E. W. Syle.

At the conclusion, Professor Ayrton brought to the notice of the Society various experiments that had been made in his Laboratory by Mr. Takamine, one of the senior students of the *Kogakuriyo* on the method of tuning employed with the *Samisen*, *Koto* and *Gueking*. At the commencement of the experiments, Mr. Takamine's attention was not drawn to the exhaustive paper of Dr. Müller on Japanese music, in order to obtain independent results. The *Samisen* was tuned successively in accordance with each of the six standard methods, the first string, instead of being stretched by a peg as usual being, however, passed over a small pulley let into the neck of the *Samisen* and strained by means of a weight to ascertain the relative number of vibrations in any one of the six modes of tuning; additional weights were added to No. 1 string to make it sound first in unison with No. 2 string, and afterwards with No. 3 string. Then, since the number of vibrations of a stretched string is proportional to the square root of the tension, the relative number of vibrations in any of the six methods of tuning could be ascertained. The *Honchioshi*, *Niagari* and *San-san-gari* gave the same results as those obtained by Dr. Müller. The *San-sagari*, however, instead of giving the 2nd, 5th and octave as stated by Dr. Müller gave the 1st, 4th and flat 7th. Now this is what might be expected, since *San-sa-gari*, which means lowering the third string, ought to be obtainable from the fundamental, or *Honchoshi*, by flattening the third. It is true that the second, fifth and octave bear nearly the same relation to each other that the 1st, 4th and flat 7th do, nevertheless, the second mode of tuning is considered by Japanese the better. Similar remarks apply to the *Ichi-agari* (printed by mistake in the *Japan Mail* Itoisagari,) and which means lowering the first. This method gives flat 1st, 4th and octave and not as Dr. Müller states prime 5th and 9th. One other method, the *Ichi-sagari*, which gives octave, 4th and prime, the reverse of the *Honchioshi*, and which method of tuning is invariably employed by the orchestra at the theatre when actors are playing on the *Koto* in consequence of the *Samisen* so tuned having a resemblance to the *Koto*, is not mentioned by Dr. Müller. All the results above mentioned were afterwards verified by employing tuning forks and by subdividing the string of a sonometer.

The *Gueking*, which he had brought for the inspection of the Society, resembled the *Biwa* in having few strings and about the same size, but it differed from the *Biwa* in the mode of tuning, in its body being circular and not pear-shaped, and in the *batchi* with which the strings were struck.

The 1st and 2nd string of the *Gueking* were both tuned to unison with the second string of a *Samisen*, tuned according to the *Honchoshi* method. The 3rd and 4th strings of the *Gueking* were *both* tuned to unison with the 3rd string of a similarly tuned *Samisen*. The instrument practically, therefore, had only two notes when using the full length of the strings. It was considered, however, that two strings tuned to unison produced a sweeter note than a single string. The *batchi* was a small piece of tortoiseshell, about two inches long. The *Gueking* which was originally brought to this country from China was a favourite instrument of the Japanese fifteen years ago. The *San-no-Koto*, when tuned according to *Hirachoshi*, reproduced the results given by Dr. Müller, with the exception that the four sharps mentioned by him turned out to be flats. There were also two other methods of tuning the *Koto*, the *Kumoinochoshi* ("high up in the clouds") and the *Han-kumoino-choshi* ("half up in the clouds"), which Mr. Takamine is at present experimentally investigating. These two latter methods of tuning were not nearly as common as the *Honchoshi*, and could only be employed after payment of a sum of money to the *Keggio* or company of blind men.

The speaker disagreed with Dr Müller in regard to the unimportance of the *Koto* which had a small number of strings, remarking that the two-stringed *Koto*, being taught at music schools in Tokio, could not be regarded as a plaything. In this instrument the length of the strings was determined by an ivory or bone thimble, worn on the left hand, the strings being plucked by a similar thimble worn on the right hand. Besides the simple notes thus produced, gliding sounds were obtained by sliding the left-hand thimble along the string at the moment of removal.

A vote of thanks was tendered to the Revd. Mr. Syle for his interesting remarks and the Meeting separated.

ON COTTON IN JAPAN.

BY

T. B. POATE, Esq.

Read before the Asiatic Society of Japan, on the 14th June, 1876.

Rich as Japan is in plants, there is perhaps not one to which she owes more than to that which produces cotton-wool, or to use the native name, *Wata*. The seeds yield an excellent oil; the cake left after expression forms a manure for the rice fields; the raw wool is used to line the winter clothes and bedding of all classes, and fabrics woven from it are worn by far the larger part of the nation. Greatly as it is now esteemed, widely as it is cultivated, the cotton plant is not a native of Japan, it is a stranger, introduced, it is true, in early times, but not successfully acclimatised till a comparatively recent period. A native of India, its growth long remained confined to that peninsula. Even the rapid spread of Buddhism, together with the flow of pilgrims from China to the holy places of India failed to make its value known; and no devout worshipper, no zealous priest appears to have carried with him the seeds of the textile plant. Cotton was destined to owe its conquest, its position in Higher Asia to persecution, the fruitful source of so many evils. After centuries of prosperity the Buddhist faith gradually decayed throughout India, and its votaries suffered terrible persecution. Some fled

to the mountains, others sought in foreign lands the free exercise of their faith denied to them in their own. The exiles brought with them the seeds which they were accustomed to sow on the plains of the Ganges. They were received kindly by their co-religionists both in China and Japan, and both the countries were amply repaid. Singularly enough cotton reached Japan first. China did not receive it till nearly a century and a half later. The following account is taken from an old and scarce book called *Wajishi*.

"In the 18th year of Yenriyaku, in the reign of "Kuwanmu Tenno, the 50th ruler of Japan, a dark-com- "plexioned foreigner landed on the shore of Mikawa, a "province in this island. He came alone in a small boat "which contained a few packages. He was rather tall, had "slightly reddish hair and enormous ears. The stranger "was received kindly by the natives, but as he spoke "some foreign language wholly unlike either the Japanese "or Chinese tongues, conversation had to be carried on by "means of signs. He hired a temple at Kawara, and "lived there for several months.

"He at length began to speak Japanese and told the "people whence he came. Unfortunately his tale has not "been preserved; but he told them that he came from India "and that the packages he had brought with him contained "the seeds of a plant which would yield a material nearly "equal to silk, and, to a devout Buddhist, much more estim- "able, as having been used by Shakya himself. He paid his "rent with seed, and not long afterwards got a house built, "the cost of which was defrayed in the same manner. In the "10th year of Yenriyaku (800 A. D.) the seed was sown; it "took kindly to its new country, and throve apace. Before "many years had elapsed it was widely cultivated. The "Hindoo lived to a good old age, and is recorded as having "been very kind to the poor and a man of great piety."

Cotton had now apparently taken possession of a new land, but after a time, the civil commotions and constant strife of the contending parties, caused

its cultivation to be neglected and, at the close of the 12th century, the cultivation appears to have been finally abandoned. Centuries were yet to elapse before the second and successful introduction was to be made. On this occasion, too, it came as the reward of hospitality. The account I give is also taken from the *Wajishi*. "In the epoch (?) Bunroku "(at the close of the 16th century) a large foreign ship, sup- "posed to have been bound to the Philippines, driven a "long way out of her course and much damaged by a "storm, anchored off the coast of Boshiu near Yokohama, "to refit. The Daimio of the district treated them with "the utmost kindness and caused every assistance to be "given them. After a stay of several months they pre- "pared to set sail, but before doing so the captain presented "the daimio with a number of curious and valuable things; "among them was a bag of cotton seed. Sowings were made; "the crop was good, and the fabrics woven from the wool "became the fashion. Fabulous prices were paid. 1lb of "the yarn sold for 100 *yen*; and as a matter of course "the culture of such a profitable plant spread with the "greatest rapidity." With increased production the price fell, and the use of cotton fabrics spread to the middle and lower orders: among the upper silk asserted its old supremacy, but King Cotton reigned, and still reigns, over the lower.

The species cultivated in Japan is that known as *Gossypium Herbaceum*. It is a dwarfish plant rarely exceeding two feet in height. Though in point of fact a perennial, yearly sowings are made. The seed-time varies from March to June, according to the locality. The usual time in this province is May. Cotton is here what may be called a secondary crop. It is very generally planted between the rows of barley. The seeds are soaked for a night in water, and then dropped into holes an inch deep, at a short distance from each other. When the plant reaches a certain height it is pollarded to obtain better yield. The flower, which appears in July, is deciduous, has yellow petals and a purple centre. The small pod left

when the flower falls, gradually increases in size and bursts in September. The pods are somewhat smaller than those yielded by the plant in China, but to make up for this the cotton is of a better quality. The average yield is about 40 lbs av. per *tan* or 120 lbs per acre, rather less than half the crop given by the American plant. As soon as the pods burst they are plucked, and, if the weather be fine, exposed to the sun to dry; if not, they are dried by artificial heat. The wool is separated from the seeds by means of the primitive roller (Japanese *rokuro*) used in India. It consists of two small wooden rollers which revolve in opposite directions, and easily throw off the hard smooth seeds. Cotton gins are now being introduced and the *rokuro* will soon become a rarity. In the cotton producing districts of Japan, the seed not required for the next year is sent to the oil factories. One bushel is said to yield a gallon of oil, the cake left is, as I have already stated, used as a manure. The raw cotton is packed in bales and sent to the merchants; it is, however, full of knobs and impurities and requires to be carded before it can used, even as a lining. Except in a few factories possessing European machinery, this operation is performed by hand. In certain quarters of the town the twanging of bows may be heard from morning to night; the sound proceeds from a room at the back or above a store, full of cotton bales. The process is carried on in a room with a smooth wooden floor. In each corner is a long flexible bamboo, not unlike a fishing-rod. Attached to the top is a piece of cord which supports the bow. The bow consists of a straight piece of wood, about 3½ feet long, with two transverse pieces at the end; to these the bow string is fastened. The operator places a handful of raw cotton on the floor, grasps the bow with his left hand and pulls the string sharply with an instrument called the *wata-uchi*, resembling two inverted cones; the upper perfectly smooth but furnished at the end with a projecting ring, the other roughly turned to make it more easily held. The vibration of the string scatters the wool and effect-

ually frees it from knobs and impurities. The carded wool is placed on a piece of oiled paper, rolled to obtain a uniform sheet and then weighed out into parcels of 10 *mommé* each. A good workman will card from 20 to 40 lbs. a day.

By far the greater part of the cloth used in Japan is still woven in the old-fashioned looms, but factories, with all the modern improvements, are gradually being established in various parts of the country, and bid fair in the course of a few years to entirely supplant them. The largest factory in Japan is that at Kagoshima, established in 1866. It is worked by water-power and affords constant employment to three hundred hands. The only one rivalling this in size is that at Sakai, but there are a great many smaller ones. There is one at Ôji near Tôkiô. It is the property of Mr. Kajima, but only turns out yarn.

The culture of cotton, though on the increase, does not by any means keep pace with the requirements of the country, and many thousand bales are annually imported. Japan, at one time, produced enough for her own use, and had a surplus for exportation: but with the exception of the last year of the cotton famine when it attained 10,000,000 lbs., the export has never been large, and has for several years entirely ceased.

Why has the special production fallen off? And will Japan, or can she, ever become a large exporter of cotton? The first query is easily answered; the second will demand careful thought. When the Southern States were put down, the supply of long stapled cotton, always the favourite, was resumed; the price and the demand for the short stapled greatly diminished; and the culture ceased to pay as well as it had done. Again, the improved system of railroads in Hindostan has enabled the peasant to bring his cotton to the market at a much less cost than heretofore. Can Japan ever become, to any extent, an exporter of cotton?

I approach this subject with diffidence, but I think that, granting certain things, it is not only probable, but well-nigh certain. The first thing to be done is to im-

prove the roads, for cotton is too bulky an article to be profitably conveyed any great distance. The second, is to introduce the American species, *G. Barbadense*. This has been done both in India and Egypt, in both cases with complete success; and though the improvident fellahs have neglected the plant and no longer produce any quantity worth mentioning of the better class, India sends yearly larger quantities to Great Britain and the other European countries, and will, in all probability, become the chief source of the cotton supply of the future. The United States yearly consume more cotton, and have in consequence less to export. At present, if I mistake not, one half the crop is required for home use, and in the near future, improbable as it has seemed, and may still seem to some, the export will be comparatively small. Japan is a long way from Europe, and it will be long before she can hope to compete in European markets with Indian and Egyptian cotton, but she has a market at her door—China; a market whose requirements are large—one which ought to be her own, but is now supplied from India.

I know it may be urged that the American cotton has already been introduced and that the results have not been at all satisfactory. Granted, but I would refer to the history of its introduction to India. A number of men were brought over from the "States," sowings were made in the American way, in a variety of localities, and the results were almost all unsatisfactory. The experiment was renewed in a different manner; parcels of the seed were entrusted to the natives, planted by them, and the results are known to the whole world. Let the same experiment be made in Japan, and I feel confident that we may look for a similar result. The cost of the essay which I advocate need be but trifling, and its results, if successful, would repay the outlay a thousand fold. Granting that in some of the more northern districts, in which the hardy *G. H.* flourishes, the more delicate *G. B.* might fail; still a hybrid could be obtained uniting the good qualities of both. I may mention in conclusion, that the oil-cake, now used for manure, forms

excellent cattle food, and that the oil itself when refined is nearly equal to olive oil. It is in fact so much like it that it is largely used to adulterate salad oil, and it is a well-known fact, in commercial circles, that few parcels of salad oil are free from its presence.

Since completing my essay I have been favoured by Mr. Nishimura of the Y. G. Gakko, with an extract from a poem on "Cotton," written by Kinugasa Iyeyoshi, the *Nai Daijin*. It is taken from an old book called the *Shin-sen Rokugiyo*.

"*Shiki-shima-no-yamato-ni-aranu-kara-bito-no-uye-teshi-wata-no-tane-watayo-niki.*"*

The cotton seed that was planted by the foreigner and not by the natives has died away.

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* See article in *Japan Weekly Mail*, May 20, 1876, p. 444 for more facts.

NOTES OF A TRIP FROM YEDO TO KIOTO VIA ASAMA-YAMA, THE HOKUROKUDO, AND LAKE BIWA.

BY

PROFESSOR D. H. MARSHALL.

Read before the Asiatic Society of Japan, on the 14th June, 1876.

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ITINERARY.

	Ri.	*Cho.*
Yedo	0	0
Takasaki	26	0
Usui gawa (r)	—	—
Annaka	2	24
Matsuyeda	0	30
Miogi san, &c. (m)	—	—
Sakamoto	2	18
Usui toge (m. p.)	—	—
Karuisawa	2	31
Kutsukake (here left the Nakasendo)	1	5
Asama yama (volcano)	—	—
Ozasa	5	0
Wagatsuma gawa (r.), Omai (v.)	—	—

m. = mountain.
m.p. = mountain pass.
r. = river.
v. = village.
ri. = $2\frac{3}{7}$ miles nearly.
cho = $\frac{1}{36}$ *ri.* 15 *cho*= 1 mile nearly.

	Ri.	Cho
Kusatsu	5	0
Kusatsu or Shibu toge (m.p.)	—	—
Shibu	7	0
Nakano	1	20
Obuse	2	0
Chikuma gawa (r.)	—	—
Zenkoji or Nagano (here entered the Hokurokudo)	3	18
Aramachi	1	9
Mure	2	30
Torii gawa (r.)	—	—
Ofuruma	1	30
Kashiwabara	0	6
Nojiri	1	0
Seki gawa (v. and r.)	1	0
Futamata	1	18
Sekiyama	1	18
Matsuzaka	1	12
Yashiro gawa (r.)	—	—
Arai	1	25
Takata	2	1
Gochi	2	0
Nagahama	1	18
Arima gawa (v. and r.)	1	0
Nadachi	1	32
Nosho	3	14
Kajijashiki	2	24
Itoi gawa (v. and r.)	1	6
Hime gawa (r.)	—	—
Taumi	1	18
Auumi	0	18
Auumi gawa (r.)	—	—
Uta	2	19
Oya shiradzu (rocks)	—	—
Ichiburi	2	29
Sakai mura...	1	0
Sakai gawa	—	—
Tomari	1	29

	Ri.	Cho
Niusen	1	21
Kurobe gawa (r.)	—	—
Mikaichi	2	22
Uwotsu	2	6
Namerikawa (v. and r.)	2	0
Joganji or Iwase gawa (r.)	—	—
Machifukuro	2	0
Arakawa (r.)	—	—
Toyama	2	0
Jinzu gawa (r.)	—	—
Kosugi	3	17
Sho gawa (r.)	—	—
Takaoka	2	25
Sembo gawa (r.)	—	—
Fukuoka	2	8
Oyabi gawa (r.)	—	—
Isurugi	2	0
Kurikara toge (m.p)	—	—
Takenohashi	2	29
Morimoto	4	18
Kanazawa	2	0
Asano gawa, Sai gawa (r.)	—	—
Nonoichi	1	34
Matto	1	12
Midzushima	2	0
Mikawa (not on main road)	1	0
Awo or Tetori gawa (r.)	—	—
Terai	1	18
Komatsu	1	25
Emai (v), Kushi (v)	—	—
Tsukedzu	2	2
Eburihashi	0	33
Sakuma (v.)	—	—
Daishoji	2	0
Kitanata (lake)	—	—
Hosorogi	2	18
Kanadzu	1	25
Gohon	1	18

	Ri.	*Cho*
Morita	2	18
Kuriyo gawa (r.)	—	—
Fukui	1	0
Asuwo gawa (r.)	—	—
Asozu	2	0
Sabaye	2	0
Hino gawa (r.)	—	—
Takebu	1	0
Wakimoto	2	0
Yuno	2	0
Yuno toge (m.p.)	—	—
Imajo	0	26
Futatsuya	2	0
Kinome toge (m.p.)	—	—
Shimbo	1	18
Osaga toge (m.p.)	—	—
Tsuruga (here left the Hokurokudo)	1	18
Hikida	2	0
Fukazaka (m.p.)	—	—
Shiwotsu	3	0
Lake Biwa	—	—
Otsu	21	0
Kiyoto	3	0
	199	13

The following notes I have been induced to write out as much from a feeling of indebtedness to those who have done the same before me for other routes, as from the hope that they might be of some use to those who should happen to travel the same road after me. The trip was taken last year during the latter half of July and beginning of August in company with a professor and student of the Kai Sei Gakko. The time when a journey is taken, in Japan perhaps more than elsewhere, it is very necessary I think to mention, as the impression formed in one's mind of the scenery at any particular place depends very much on circumstances as e.g. the season of the year, or the

state of the weather. In early summer the hills at one place may be loaded with pink azaleas and purple fuji *(wisteria Chinensis)* later on they are green. At one time a valley is nothing but offensive mud, at another it is clothed with the rich verdure of young rice, or, it may be, spotted with the white blossoms of buckwheat. All these differences depending on time necessarily make those who have traversed the same route bring home varying accounts of the scenery they have passed through.

There are two main roads from Yedo to Kiyoto, the Tokaido which passes along the Southern coast of the island, and the Tosando or Nakasendo, the mountain road which goes through the centre of the island. These meet at Kusatsu a town 16 miles (6 *ri* 24 *cho*) from the ancient capital and after which they cease to be distinct. The Hoku-rokudo, or Hokkokukaido, branches from the Nakasendo at Oyuwake in the province of Shinshu, and after passing through the provinces Echigo, Echu, Kaga and Echizen along the Northern Coast (as its name implies) again meets the Nakasendo at Toriimoto in Omi, where it stops. The first part of this trip was taken by the Nakasendo, nearly all the rest by the Hoku-rokudo, a road as yet very little known to foreigners.

Takasaki, a great centre of the silk trade and chief town of Joshu, 63 miles (26 *ri*) from Yedo viâ Nakasendo, it is well known can now be reached in one day by coach. This method of getting over the plain of Yedo is not comfortable, but certainly better if the weather be warm and is twice as fast as by *jin-riki-sha*. This part of the trip I pass over without further remark because it is already fully described in the transactions of the Society. From Takasaki the road ascends gradually until it crosses Usui toge (mountain pass) a distance of about 22 miles (9 *ri*) to the summit. The river Usui which follows from the *toge* is crossed by a bridge of boats at an interesting part of its bed before reaching Annaka, a long straggling town which was formerly a *joka* or castle town. Between Annaka and Matsuyeda the road part of the way

consists of an avenue of cryptomerias which reminds one of, although it is much inferior to, that leading to the tomb of Iyeyasu at Nikkô, and in the middle of it there is a very fine pear garden where the horizontal training of pear trees is well seen. After the avenue we passed through a mulberry plantation and soon after found ourselves quite surrounded by mountains. From one part of the road near Matsuyeda a fine view of part of the valley of the river Usui and of Miogi-san is obtained. Miogi-san is the name of one peak of a fantastic range of mountains, but as there is no name to the range I refer to it by that name. Matsuyeda is the best place to start from to explore a most interesting part of this curious range of mountains and I recommend every lover of Nature's wonders, who has sufficient time, to spend two days off the highways, amongst them. The first day he might visit the temple called Miogi-san which is situated near the bottom of the rock of the same name and which is well worth visiting. The noble cedars and well-built walls, the long mossy flight of steps, the handsome bronze *torii*, and the sacred aspect of the spot remind the traveller as yesterday of the renowned Nikko. Looking towards the summit of the mountain he will see an enormous letter 'Dai' (*dai no ji*), which from below seems to be painted pure white. This letter is reached after a stiff climb of 25 *cho*. It is situated on the summit of one of those oddly jutting up peaks which characterise this group and from it there is good view of the plain stretching to Yedo. The climber is astonished to find when he reaches the '*dai*' that it is a large framework of thin bamboos tied together and on it are suspended hundreds of votive papers of pilgrims, which from their white colour give the structure from below that striking appearance of being painted white. Its dimensions are 30 ft. by 20. Three *cho* higher up is a small temple called Okunoin, and above this the hill is nearly perpendicular and seemed so dangerous to climb that I didn't attempt it. Retracing his steps, the traveller will do well to put up for the night at Matsuyeda, or better still at one of the tea-houses

a little below the temple he has just visited, and next morning let his guide take him to Kurakake-zan and Daikoku-zan. The object which we had in view on starting to these places was to investigate the nature of a hole which is seen in the mountains from the highway between Matsuyeda, which we had just left, and Sakamoto the next town on the road and which I shall therefore refer to again. To reach these places we went to the bottom of the temple steps, then turned off to the left, when we found ourselves in a well-beaten pilgrim path which continued all the way. The walk amongst the rocky hills was interesting. We soon found, contrary to all expectation, that there is a valley between the hill nearest the highway where the hole is seen and the hill which contains the hole. After climbing for some time we saw on our left a rocky hill with a great hole piercing it near its summit, which at first we thought was the hole we were seeking. Next we came to a pilgrim rest where there is a handsome stone lantern. Higher up to another of the same even handsomer than the first. At last we reached Kurakake-zan where the rocks are particularly interesting and very curious. Most striking is an enormous natural arch in the shape of a Japanese saddle (whence probably the name). On the right are two lofty cylindrical rocks standing upright called the 'Candle Rocks,' and all about are other rocks in curious positions. Climbing through the arch to a small shrine, one gets a finer view of the arch and mountains below, while above is seen the hole we came in search of. This like the first we saw is just a great hole in the summit of the rocky hill and has no great depth, which it appears to have from the highway. I climbed and looked over the ridge a short distance from it, and nearly on a level with the bottom of it, and then found that it could only be the upper part which is seen from the road because the opposite hill between the road and the hole was above my level. Leaving Kurakake-zan, we wended our way to Daikoku-zan, where to our great surprise we came in this out-of-the-way region to a large house and two temples,

the lower one called Daikoku-zan, the other reached by a long flight of well-made steps, called Bosongongensan. Above the latter is another of these strangely jutting up rocks (called Higesuri-iwa) which from below look quite inaccessible. It can, however, with care be climbed to within 10 ft. of the summit, but to do this last stage requires a ladder. I could not see a trace of earth near the summit but a pine tree is growing there with the pilgrim's flagstaff tied to it.

This whole region is evidently of volcanic origin. We saw great quantities of pumice and trachyte, and the configuration of the region is doubtless produced by the washing away of soft matter, the hard rock being left behind.

At Matsuyeda there is good accomodation in the Honjin, a house covering a great area, and which is the same as the Tsuwunkaisha, the office where *ninsoku* and horses are hired. Those who don't walk should engage pack-horses or *kagos* here to the next station Sakamoto, as *jin-riki-sha* are very unsuitable. The road is very picturesque, up and down hill, Miogi-san and, unless it be covered with clouds, Asama-yama seen all the way. Half way the hole in Kurakake-zan becomes visible and from there looks like a deep tunnel piercing the mountains. It is best seen from the village Yokokawa, where the people call the mountain Nakagiri-yama or Iruwaki Daijin Inuki-yama, the former name meaning 'the mountain cut in the middle,' the latter derived from the name of the hero who made the hole. The story in connection with it is that the Mikado's archer many hundred years ago, named Iruwaki Daijin, standing at a stone on the road (yet pointed out) in this village shot an arrow through the mountain. The place where the arrow fell on the other side is called Yaochi or Arrow-fall.

Leaving Sakamoto, Usui toge is crossed, a long mountain pass of 7 miles (2 *ri* 31 *chô*) to the first village on the other side called Karuisawa. It leads from Joshu to Shinshu and is one of the most beautiful mountain passes in Japan. The views from horseback are very beautiful and varied. The hills and valleys are all loaded with fine

trees of all kinds and shades of colour. On the right, in ascending some pretty rocks called Kirizumi-no-iwa, will be noticed, also a hill remarkably like a miniature Fuji called Haruna-san. If the season be too dry for the crops the farmers ascend this mountain and bring water from the top to sprinkle on the fields, after which the rain is said to pour down from heaven. On the summit of the *toge* there are several dwelling houses and a very old temple dedicated to Izanagi Izanami no Mikoto, the ancestor of all the Japanese, which is worth visiting. In descending one is much struck with the great change in the nature of the scenery, which on the Shinshu side is hardly equal to that on the other. One of the most striking objects in the scenery on this side is a curiously situated hill, quite isolated, called Atago-yama. It is close to Karuisawa. At this village it was that we made arrangements to ascend Asama-yama the largest active volcano in Japan. Our plan was to engage horses to await us early in the morning at Kutsukake, a village 2½ miles further on, whither we travelled by *jin-riki-sha*, a pleasant smooth drive with magnificent views of the volcano. At Kutsukake we hired a guide and mounted our horses which took us as far as a place called Hanada, a distance of about 5 miles. The views of the high mountains of Shinshu and neighbouring provinces during our ascent were grand. The most striking peaks were Miogi-san, Nakano-san, Komaga-take, and Yatsuga-take, while enveloped in clouds was On-take in the distance. To enhance the pleasure of our ride we were accompanied all the way by the pleasant and rare cry of the cuckoo. Leaving our horses to await our descent, we next passed through some thick forest. From below Asama looks bare a long way down but we found vegetable life to a height of about 7,000 ft., the last being a kind of coarse grass. Above this was only lava of small specific gravity and of a grayish colour and considerable quantities of volcanic dust especially near the top. About 500 ft. from the highest point we reached the old crater

which 95 years ago was the source of destruction to 48 villages, which have never since been rebuilt. Here we found plenty of insect life. The new and active crater is an enormous hole (roughly guessing, not less than 600 ft. diam.) entirely filled with steam and vapour of sulphur and roaring very loudly. All round the edge are large fissures wherein rocks hang in a very unstable condition, ready as it were to fall into the molten mass beneath. From these fissures, as well as from many holes some distance from the crater, steam and sulphur fumes are emitted. We took the temperature of this vapour at different places and the highest we found was 73° C. It is of course this steam and sulphur vapour which form the perpetual white cloud on the summit of Asama, and as one nears the top it is necessary to notice in which direction the wind is blowing in order to finish the ascent on that side from which it blows. We did not consider the mountain a difficult one to climb and thought ourselves well repaid for the trouble. The height our aneroids indicated was 8,500 ft.

Our descent was neither so pleasant nor successful as the ascent. After descending about 1,000 ft, it began to rain and soon after a severe storm followed, accompanied by thunder and lightning. To add to this misfortune, a thick cloud covered us, and our guide lost the track, in consequence of which, in addition to being put in very great danger, we had a full hour's extra fatigue, and were so wet when we reached our horses that we thought it prudent to walk a mile and a half to the nearest tea-house called Wakasari no chaya, and there change our clothes. This house was far too poor to lodge us all night, so we had to make up our minds to go on to Kariyado Shinden whither we had intended to go in the morning. This town is seven miles from the tea-house and we started at 6 p.m. However our troubles, although it was a fine night to travel, were not yet to cease. The men who led the horses lost their way twice, and after being taken through a vast wood for 3½ hours in which we passed only two woodmen's huts, we were landed at a village 5 miles from

the one we had intended to lodge in. Indeed when we reached the second of these huts our trust in our leaders was so utterly exhausted that we engaged the male inmate to guide us to the nearest village which was then still 2½ miles distant. To do the men justice, however, I should mention that they were warned at the tea-house above referred to against the direct road, on account of a rotten bridge which it wasn't safe for the horses to cross, and besides they came to our hotel next morning and humbly apologized for their mistake. Further the extra ride was not uninteresting as we passed through the sites of many of the villages destroyed at the last great eruption. For a long way after reaching the bottom of the mountain the ground was covered with lava, then we passed through a forest of fir, oak, birch, and chestnut trees, the ground being covered with grass. After this the wood became thicker and richer, and there were in it some enormous rocks which in the dark looked like houses. The village we landed in is called Ozasa, and is twelve miles from Kutsukake from which we began the ascent of the mountain and where we left the Nakasendo. Should any one chance to pass this village, he might find pleasure in visiting a chasm seventy-two feet deep at one end of it. It is a very picturesque spot and close by is a slope, from the top of which there is a fine view of Asama on its N.W. side, where the bed of the great flow of lava which came down at the eruption of 1781 is situated. This view of the mountain is much more interesting and very different from that on the other side. The 8th of April is the day for women to ascend Asama, that being the first day of the great Buddha festival. Our landlord at Ozasa told us that only five years ago the roaring of the crater was heard distinctly in this village, that the vapour ascended to an enormous height and that the wind carried with it considerable quantities of volcanic dust. (Since writing this I have noticed that the same eruption is referred to by Captain Descharmes, and I have therefore more confidence in noting it.)

To the west of Ozasa is another high and very sacred

mountain called Haku-san. There is a temple on the top of it and there our landlord told us the cherry trees were in blossom. This was July 16th, three months at least after they are in blossom in Yedo.

The ride from Ozasa to Kusatsu, the next place of importance in our journey, was very pleasant and interesting. We first travelled through a most magnificent valley watered by the Wagatsuma-gawa (my wife river), a river which flows into the Tone-gawa at Mayebashi. The bed of this river is very singular. Nearly all the way we travelled along it, it flowed in a deep ravine, one side of which is an agglomerate, while the other is a sand formation. We were fortunate also in our views of Asama. The air was perfectly clear after yesterday's storm, and not a cloud was near it except that snow white mass emitted from itself. Unlike Fuji-san, it has a long flat summit, and so far as mere shape is concerned is uninteresting. The villages we passed through were poor.

Kusatsu has already been so fully described in the transactions of the Society by Capt. Descharmes that I have very few additional notes to make. It is not a large village and every house seems to be an hotel. These are conducted in a different way from those of other towns, inasmuch as guests engage servants for themselves, and get their food ready cooked from shops. The reason of this is to enable very poor people to visit the baths, who can then bring their food with them, food being very expensive in such an out-of-the-way place. The houses, as in many other mountain villages, are all covered with large stones, presenting a strange appearance, and this is not because strong winds prevail here, but from the scarcity of bamboo to keep the houses tight. The four principal baths (of which there are altogether about 20) are in the centre of the village and are frequented chiefly by syphilitic patients. In these we saw a regular process gone through of first stirring the waters by means of planks of wood, then washing the head and pouring water over the body, then sitting steaming and putting cloths or *tabi* on the feet, and lastly entering the baths of which

before the stirring we found the temperature to be 52½° C. The faces of the bathers indicated that they felt the heat intensely but perhaps this arose from the sores on them, as the Japanese have been long accustomed to parboil themselves. All the lepers that we saw had their faces entirely covered with burns of the *mogusa*, which is just tinder made from chopping up a mountain grass, and when applied is set on fire with a view to blistering the skin. Like other sulphurous waters, the water supplying these baths bubbles out of the ground. The highest temperature we found in a bath was 61° C. and the temperature of the stream bubbling up which supplied this was 63°. The baths at Ichii-ya, where we lodged, on the outskirts of the village are said to be the coolest of all, having a temperature of 43° to 45°, and these have also a great advantage in having a stream of cold water falling near them. Here the healthy portion of the inhabitants came for their evening bath, and presented to the European traveller a scene which hitherto he had only dreamt of. About a mile from Ichii-ya is the source of the stream which principally supplies these and many others. It is near Sainokawara where the remarkable rocking stone mentioned by Capt. Descharmes is situated. This stone and many other large stones near it are perforated all over with holes, probably on account of the soft parts being washed out by rain. They seem to consist chiefly of oxide of iron, and on them are piled small stones by the people who imagine by so doing that they benefit their dead relatives. Around this place also many fossil leaves in a soft condition are found. Kusatsu we found to be 3,800 ft. above the sea-level. It is one of the coolest and most interesting places we passed in our journey. On comparing the thermometric readings taken in Kusatsu on July 17th, 18th, and 19th with those recorded in Yedo by Mr. Joyner, I find an average difference of 8° C., or 14° F. for those days, in the temperatures of Kusatsu and Yedo.

Leaving Kusatsu, we crossed the mountain pass called Kusatsu-toge, or Shibu-toge, because it leads from Kusatsu to Shibu. We could hire only cows to take us across this

pass because the natives said it was too rough for horses to go. However I found it one of the easiest and most beautiful climbs I have undertaken. About a mile and a half from Kusatsu we came in close to Riyofu-no-taki, a very pretty fall of about (roughly guessing) 100 ft., over a rock completely covered with oxide of iron which looked like rotting wood. Shortly after Shirane-san, an interesting mountain apparently covered with red oxide of iron to the summit, and quite bare, comes into view. On this mountain many fine crystals of sulphur are found and a stream of water impregnated with alum and sulphur flows down from it. At the place where this stream crosses the road there is a notice engraved on stone '*Doku midzu*' (Poison water), but before this was brought to my notice, I had taken a good mouthful to quench my thirst which it didn't do as the water was warm and tasted strongly of alum. All the way from this stream to the summit which we reached at 10 a.m., there were grand views of Asama-yama, Shirane-san, the mountains of Shinshu and neighbouring provinces, and the peerless Fuji towering above all in the distant horizon. There was snow in some of the valleys of the *toge* and on Shirane-san and Asama. On reaching the summit we were struck with the magnificence of the high mountains of Hida, a range beautifully streaked with snow. Our aneroids indicated a height of 7,000 ft. In our descent we came along the side of Yotoke-san, the highest mountain in the east of Shinshu. Shortly after leaving the summit one notices a conical hill called Kazaga-take, on the other side of which lies the famous Zenkoji which we visited the next day. Further down there comes into view a very beautiful plain called Kawa-nakajima (the river island) where, according to Japanese story, a great battle was fought between the two heroes Shingen and Kenshin, and shortly afterwards the lofty peaks of Mioko-san and Togakushi-san tower above the clouds. Altogether this is a magnificent pass and for high mountain scenery surely unequalled in Japan. It is the highest, and I should think also the longest, mountain-

pass in Japan, the distance from Kusatsu to Shibu, the nearest villages on each side, being seventeen miles. Riding on cows we found rather more comfortable than on pack-horses but a little slower. Next day we travelled to Zenkoji famous for its great Buddhist temple. The road is interesting, most of the way through a plain where we felt the heat intensely, and crosses the broad Chikuma-gawa which flows into the sea at Niigata. It was at Zenkoji that we entered the Hoku-rokudo. The temple, approached like that at Asakusa in Yedo with two handsome gates, is 198 feet long, 108 broad, and is elegantly built, the roof being of the costliest kind. It contains the golden Buddha brought from Corea through China, and on payment of a *bu* the curtain which hides the cabinet containing this image was lifted for us, but only in the midst of the sounding of gongs and the chiming of a bell. The cabinet consists of seven gilt boxes one within the other, in the innermost of which is the golden Buddha. The lifting of the curtain impressed those who were present immensely, everyone taking advantage of the favourable opportunity to supplicate the mercy of the god. There are many other interesting things to be seen in this temple.

Leaving Zenkoji we travelled next day to Seki-yama through some high mountain scenery. The most prominent peaks are Idzuma-san, Kuroshime-san, and Miuko-san, and behind these the high mountains Togakushi-san, Okunoin-san, and Yaki-yama. This last is an intermittent volcano, active at present. At Nojiri there is a very pretty lake containing a small but beautifully wooded island dedicated to the worship of the goddess Wugaia (Benten), one of the seven gods of good luck of the Shinto religion. Seki-yama the province of Echigo, best known to foreigners from the mineral oil found there, is entered. At Takata, one of the largest towns in this province, the road to Niigata separates from the Hoku-rokudo. This town is built as I have heard Niigata is, viz.: with pavements on both sides of the streets covered by the projecting roofs of the houses. By this means the people are protected from the snow in the winter and the

sun in the summer. Immediately after leaving Gochi the beach of the sea of Japan is reached, and between this and Tomari there are only occasional portions of made road —the beach being regarded as the route to be taken. However, riding along it we found a pleasant change to riding inland. Between Gochi and Arima-gawa, the prominent summit of Yone-yama, stretching far into the sea, forms a striking object in the scenery, and as the latter village is neared there is a very beautiful part of the road over a hill descending to the river, especially in the variety of shade and luxuriance of the foliage. Further on there comes into view a range of mountains much covered with snow, including Kurashime, Rege, and Echo-yama, while behind in the distant horizon is the gold-bearing island of Sado. Between Nadachi and Nosho we saw many women far out in the sea, diving for a species of seaweed called *tego-kusa*, which is very much prized and used to make a kind of jelly called *tokoroten*. They seemed to keep swimming, diving, and pocketing the weed with little or no difficulty. It was curious also to see the children bathing and floating in tubs. We noticed that here the rising generation have very dark skins, indicating how much they lived naked in the open air—naked children both boys and girls being very commonly met with. In this part of the coast hemp is one of the chief products of the soil, and we found all the natives making rope or fishing.

Itoi-gawa, could one but get European food and accommodation, would make a pleasant summer resort. In this village there is abundance of delicious fish and a fine pebbly beach for bathing, which one can do at any hour of the day, because there is scarcely any tide. The inhabitants, however, are yet little accustomed to foreigners, as about two hundred men, women and children collected on the beach to see us swim—not a small number out of a village of 1,300 inhabitants. For a great part of the way between Auumi and Uta there were enormous blocks of granite which didn't require any quarrying. Also a high bluff consisting almost entirely of limestone, which was convert-

ed into lime on the spot and boated away. From Uta to Tomari a distance of over 13 miles we travelled by boat, which was dragged by two men and steered by one. This was by far the pleasantest and least fatiguing way we had yet travelled. Oyashiradzu (not knowing parents), which we passed, are high precipitous rocks affording very little passage room between them and the water, so that when a west wind blows it is a dangerous part of the road, as the name implies. The rocks are full of small caves, which enable travellers to shelter themselves in stormy weather, when a guide who gives the command to pass from one cave to the next, is quite necessary. It is said that people have been confined in these caves for two and three days. From Tomari the Hoku-rokudo becomes again more worth calling a road and is no more along the beach. Between this and the next village, Niusen, it passes through rice fields, and in these we saw the labourers stirring up the mud about the roots, with thick bundles of straw on fire tied behind their backs, that the smoke therefrom might keep off the mosquitoes. On the left is a fine range of snow-covered mountains called Kurobe-no-mine. On to Uwotsu the scenery is much of the same kind except where the river Kurobe is crossed, the mouth of which is more than a mile broad and much divided into separate streams. Between Nameri-kawa and Machifukuro another broad river is crossed, called the Joganji-kawa or Iwase-gawa. Here the water has a mineral taste. At Toyama we were told the surrounding country is full of springs, and artesian wells can easily be sunk, whence the water rises 2 or 3 feet above the ground. At the end of this large town the river Jinzu is crossed by the Funa-bashi, the longest bridge of boats in Japan. Thence to Takaoka the road goes through a large well-watered rice-plain, on one side mountains, on the other sea, and much of it is lined with fir trees like the Tokaido. Here the snow-capped Haku-san is a striking object in the landscape. On to Fukuoka the road was covered with *suge*, a kind of reed, laid out to dry. It is used principally to make hats, an industry

for which the next province Kaga is famous. This province is entered when Kurikara-toge is crossed between Isurugi and Takenohashi. In ascending this pass we met many women, each with two baskets of fish and pole on the shoulder, running down the hill very fast, desirous, I suppose, of getting a good market in the villages on the other side of the pass for their fish caught 5 or 6 miles distant. We dined on some of these fish on the summit of the pass, and on asking our hostess for the bill, were surprised to be asked *rok-kuwan happiaku*, but our equanimity was restored when we found from the change that *ik-kuwan* equalled 5 *sen* and *hiaku* half a *sen*. When we informed our hostess of the different values of *hiaku* and *ik-kuwan* in Yedo and in Kaga, she in her turn seemed surprized! In descending we had two particularly good views of the sea of Japan, with wooded valleys in the foreground, the first on the left, the second on the right.

The next town of importance on the Hokurokudo is the capital of the province we have just entered—Kanazawa. It is a large town with wide clean streets, and when viewed from a height looks quite like a garden, so numerous are the trees cropping up amongst the houses. It possesses a silk-thread factory similar to that in the Kobusho buildings in Yedo, but here steam is used instead of water-power. A steam engine in such a town is surely a step in civilization. The castle is very picturesque and in its important features like those of Yedo, Hikone &c. Two considerable rivers flow through the town, Asanogawa and Sai-gawa, both crossed by well-built wooden bridges under which in the warm summer evenings the people go to cool and enjoy themselves as under the Shijobashi in Kioto. Strange sight there to see the bed of the river covered with tables, happy people reclining on them drinking tea and otherwise making merry, and the whole lit up with two or three hundred eastern lamps.

In Kaga, and I think also in some of the neighbouring provinces, the people say '*ya*' for '*hai*' of the Yedo dialect, and use it very much as the Germans do the same word. The dialect of this province has many other

differences from that of Yedo. Leaving Kanazawa our next goal was Terai, the headquarters of the manufacture of the well-known Kaga porcelain. From Midzushima we could not go the direct road to Terai on account of the flooded state of the river Awo, but had to wander by Mikawa and the mouth of the river and boat across many a field before we were landed safely again on the main road. At Terai we examined the manufacture of the porcelain in the house of Mr. Shozo the chief manufacturer. First the clay is shaped, then baked, after which the black portions of the design are painted with *togusa*, (which is brought from China) and the dish baked again; after this the red parts of the design are painted with *beni*, the well-known pigment used to paint the lips, then baked again; finally the gold and other colours are put on and baking repeated. The clay is brought from the famous valleys Ku-tani and Nabe-tani which are about 5 miles from the town. The red porcelain is said to be peculiar to Kaga, but whether it is because the Kutani clay takes the red on better than other clays, I could not get trustworthy information.

From Terai we had a pleasant *jin-riki-sha* drive to Komatsu, the next town on the road, in the midst of a golden sunset which illuminated a fine range of mountains in the East, in the centre the high and snow-capped Haku-san or Shiroi-yama. Soon after leaving Komatsu we came upon two large inlets of the sea united by a canal which crosses the road at the village Emai. In these it is said fish are caught in large quantities. We next passed through a tea-district when the villagers were engaged preparing and sorting teas. The larger leaves before roasting were steamed, sunned, and afterwards rubbed between the feet as they are too hard to be treated at once like the young leaves. From Daishoji to Hosorogi the road is hilly but smooth and pleasant for *jin-riki-sha*. The scenery is beautiful, mountains and valleys on the left, valleys and the sea on the right. The ground is cultivated only in small patches at the bottoms of the valleys, in many of which pretty little villages are seen.

From Kanadzu to Morita the road passes through a great plain in which there were growing all kinds of crops—rice, various species of beans, cotton, millet, indigo, hemp, potatoes, different species of melons, &c.

The next important town is Fukui. The situation of this town is admirable. Hills surround it closely, affording most picturesque views, and as one enters it he feels as if entering an inhabited garden. The ivy-covered walls of the old castle cannot but remind its former inmates, as it did us in imagination, of the good old days of yore when the *sake* flowed there and the *geisha* sang.

The river Asuwa flows through the town and is crossed by the Tsukugo-bashi which at one end has a fine gate called Terute-gomon. From Fukui to Takebu the next 12 miles was among the easiest and most beautiful we had travelled. Here mountains tower over mountains and are green to the highest point. On to Yuno-toge the scenery even improves. The flat valley covered with young rice looks like a green sea and the mountains rise suddenly from its level. One of these called Hinaga-take is a striking object in the scenery. Yuno at the end of the valley is charmingly situated. At the summit of Yuno-toge, which we now cross, there are four *yasume-ya* (resting houses) filled with girls, who no sooner see a traveller coming than they all set up a shouting and clapping of hands, quite to the alarm of the unexpecting pedestrian. The view from the summit is very pretty and the descent even more beautiful than the ascent. We see still on this side the river Hino which watered the valley just left, winding peacefully round one of the mountains on its pebbly bed. The rich green rice fields separated only by borders of the dark-leafed bean, and the trees, some covered with velvety moss, others with rich ivy, rich cryptomerias, graceful acacias with their feathery pink blossoms, here look exceptionally beautiful. Between the pass and Futatsu-ya the road winds through a valley which reminded me of that of the river Watarashi between Nikko and Omama, but there is wanting the grand river and rock scenery of the latter. From Futatsu-ya

the road crosses the thickly-wooded Kinome-toge and Osaga-toge to Tsuruga, one of the principal seaports in Japan. Tsuruga harbour is undoubtedly one of the best in the island. It is not large but is surrounded by hills which rise suddenly from the sea-level and afford perfect shelter from all winds. Junk-building is one of the chief industries of the place. There is a temple called Kino-miya in it, said to be the most famous in the five provinces around; a fine large red *torii* and a handsome stone lamp appeared to me the only objects of interest in it.

From Tsuruga the Hokurokudo goes round the N. E. end of Lake Biwa to meet the Nakasendo at Toriimoto and there it ends. Those, however who, by this time, in spite of the beauty of the country they have just passed through, are tired of tinned meats and live *futons*, may branch off across Fukazaka to Shiwotsu, whence two steamers go daily across the whole length of Lake Biwa in 7 or 8 hours to Otsu, which is only 7 miles from the ancient capital. Fuka-zaka is a rough mountain pass. In ascending it the traveller will be struck with the barrenness of many of the hills, many of these being just yellow sand so different from those he has lately passed through. From the summit there is an interesting view of Tsuruga harbour, which from here looks more like a mountain lake than part of the sea.

Lake Biwa is so called from its resemblance in shape to the musical instrument of the same name. It is also called Lake Omi from being situated in the province of that name. According to Japanese fable Fuji-san was raised and Lake Biwa sunk in one and the same night. There are four islands on the lake called Chikubushima, Okinoshima, Takeshima, Shiraishima. The first of these is the most interesting, and is a pretty wooded isle twenty-five *cho* in perimeter containing a temple and some houses. One side of it is covered with white lake birds, the guano of which foreigners are said to have shipped in large quantities when they first visited it. One of the best views of the lake is from the *yagura*

of Hikone castle, which anyone who has the ambition to do all the Hokurokudo or who traverses the Nakasendo shouldn't miss visiting. Those who are fond of Japanese mythology will find great pleasure in staying a day or two at Otsu and visiting the places of interest around it. To the N.E. is the Fuji-like Mikami-yama where lived the centipede whose tail wound round the mountain seven and a half times, and which was killed by Hide Sato. This great hero shot the deadly arrow from Seta-bashi, a bridge in two parts, which crosses the outlet of the lake, and for his skill was rewarded by the goddess Dingnu with a large bronze bell which is still in Midera, a temple interesting from its antiquity and connection with Japanese history as well as from the beauty of its grounds.

Another object of considerable interest is the old pine-tree at Karasaki. To reach this is a pleasant walk of three miles along the west margin of the lake in the direction of the sacred Hiyei-zan. It must be an enormous age although not quite so old as the Japanese say, who make it older than Jinmu Tennô the first emperor of Japan. It has been trained to spread over as large an area as possible, and shews that the Japanese taste of training pine-trees in this way is very old. The outermost branches spread far into the lake. We measured the perimeter of the polygon formed by the principal outermost supports and found it to be 477 feet, while the principal branches stretched from the centre of the trunk to a distance of from 77 to 83 feet.

Another place that should be visited from Otsu is Ishiyama, celebrated in song. To reach this the Tokaido is followed for 3½ miles to near Seta-bashi, and then for another mile a road to the right along the outlet of the lake, here called Seta-gawa. In this last part of the road a small shrine will be noticed covered with a large number of stones hung up by strings. These, we were told, are offerings from those who are afflicted with diseases of the eye to the god whose assistance is prayed for. Ishiyama derives its name from there being at its base a natural collection of large rocks, presenting a

very fantastic appearance. They are approached by an avenue of maple trees, and on the hill above them there are many temples and monuments of various styles of architecture. The rocks, and especially a small shrine above them, are covered with pieces of paper rolled up and tied on them. These are the offerings of beating hearts who have written on them something connected with one they have seen and loved. Our Japanese friend opened and read one, and on it was written his age and when she had met him! Sad tale to tell! From the summit of Ishiyama the moon is supposed to appear clearer than from anywhere else and there people go to view it. From there also there is a good view of the lake, the bridge, the river Mikami-yama and the strange Hagetonya-yama, a barren sandy range of mountains behind Mikami which can be seen best from its summit.

To reach Kiyoto from Otsu I should advise everyone to take the hill road at the foot of Midera, as then half of the main road which is rather uninteresting is avoided. There is a great amount of traffic on this latter road. Bulls of a large size are used to drag the merchandise along; but, only two years ago when the road was quite full of deep pits, men and women were also employed to do the same work and certainly they looked more like beasts than human beings. This I note because now that a railway is determined on between the city of the Mikados and the lake, it shall soon be one of those customs quite forgotten, and was the only revolting sight we experienced in or around what is undoubtedly the most interesting city in Japan.

ASIATIC SOCIETY OF JAPAN.

A General Meeting of the Asiatic Society was held in the *Jio Gakko*, Yedo, on the 14th June 1876, Rev. Prof. Syle in the chair, which was afterwards taken by Rev. D. Veeder and finally by Sir H. S. Parkes, Vice-President.

The reading of the Minutes of last Meeting was omitted—a copy not being at hand.

The Secretary submitted (in accordance with the Council's Resolution of 6th Oct. 1875) a list of proposed office-bearers for the coming year. This list containing the names of more officers than the rules of the Society contemplated, the following resolution was submitted as an amendment, according to Rule 29.

Resolved to amend Rule 10, by substituting the words "Ten Councillors" for "Five Councillors;" and "Two Recording Secretaries" for "One Recording Secretary."

A Committee of ordinary members was thereupon appointed, in conjunction with the Council, to report on the proposed amendment at the next General Meeting; the members of the Committee being Dr. Veeder, Dr. Eldridge, Mr. Wilkin, Professor Grigsby and Mr. Dallas.

The corresponding Secretary reported having received communications from the President of the Organizing Committee of the International Congress of Orientalists, Professor Grigorieff, inviting the Society to send a delegate to the Congress to be held on the 1st of September, at St. Petersburg, under the auspices of the Russian Government. Professor Summers stated that H. E. the Russian Minister had expressed his readiness to forward any objects of interest for exhibition on that occasion, if sent to him not later than the 5th of July: whereupon,

Professor Summers moved and Professor Perry seconded the resolution "That Ernest M. Satow Esq. be requested and authorized to represent the Society at the approaching Oriental Congress at St. Petersburg." Carried unanimously.

Professor Syle mentioned that Mr. H. Pryer, a member of the Society was about to visit the interior as a naturalist, and suggested that a sum of money might be placed in his hands for the purpose of procuring specimens &c. for the Society's Museum. Whereupon it was moved by Mr. Dallas, seconded by Mr. Grigsby and carried:—

"That this Meeting recommend to the Council Mr. Pryer's journey as a praise-worthy object for assistance, provided that the Council consider that the Society has funds in hand to devote to that purpose."

Mr. Poate's paper on Cotton in Japan was then read. Sir Harry Parkes observed that it dealt with a very practical subject; that if Japan could grow cotton enough for its own consumption it would be satisfactory; if sufficient for export so much the better; but he was afraid that this could not be done. Japan being a mountainous country it might be too

cold except in the flat tracts of land. Moreover Japanese cotton was of a short staple, though fine, and was not in request in Europe. The yield was very uncertain, and the farmers could not rely on their crops. Whenever there was a poor crop in this country Japan had to import raw cotton to a great extent from China. The value of the import in 1873 was $146,569; in 1874 $1,155,076, and in 1875 $255,690. Besides this a deficient crop necessitated extended purchases of English yarn.

Prof. Atkinson asked Mr. Poate whether he had any information respecting the botanical characters of the cotton plant first introduced. He (Prof. A.) had been told that the Japanese called the cotton plant first imported, but which was afterwards lost, "tree cotton" on account of its size; whilst that at present cultivated was known as "grass cotton." If this were known it might afford a clue to the country from which the first supply was obtained.

Mr. Poate stated that the yield in Japan was small, about half that of America, which reached 250 to 300 lbs. per acre. Dr. Veeder thought the introduction of American cotton, with good husbandry, into Japan was worth trying. In the Slave States, before the war, the ground was exhausted by cotton cultivation and the desire to extend its cultivation by slave labour in the Free States was one of the causes of the American Civil War.

Professor Marshall then read his paper, "Notes of a journey from Yedo to Kiôto *viâ* Asama-yama, the Hoku-rokudô, and Lake Biwa," which was well illustrated by diagrams and maps. Some of the celerbated Kaga porcelain was exhibited also. Sir Harry Parkes said that such an itinerary would be of great use. He believed that few foreign travellers, if any, had preceded Mr. Marshall in the Hoku-rokudô, and his, at least, was the first account which had been received of that route. He could, from his own experience, testify to the beauty of much of the country described in the paper and to the accuracy of the statements of Professor Marshall, who had done good service in recording his observations for the benefit of the Society. He knew of no more interesting trip than that to Asama-yama. Dr. Veeder stated that Asama-yama was sometimes visible from elevated points in Yedo.

CHALYBEATE SPRINGS.

Osaka, Tsumi-machi, 23rd Nov., 1875.

To Mr. AYRTON,

The Corr. Secretary of the Asiatic Society.

DEAR SIR,—Some months ago I was requested by the Japanese Government to make an analysis of the hot chalybeate water of Arima, and now kindly beg of you to have my result inserted in your periodical of the Asiatic Society. It is as follows :—

Properties.—The water is almost clear, colourless, without scent; the taste indicates the presence of much salt and chalybeate; exposed to the air, it loses some carbonic acid, while at the same time its surface covers itself with hydroxide of iron, afterwards found at the bottom as a brown-redflocky powder, mixed with silicates, indissoluble in acids. Tincture of litmus is slightly reddened by it, which indicates the presence of a little free carbonic acid; the quantity of which I could, however, not determine, on account of my not having been at the spring myself. The water was sent to me at the laboratory in two portions, the first in the month of September, and the second in October 1875.

The specific gravity of the water is at the temperature of 23° Cels. : 1.0115. One liter=1000 C. C.=1011,5 grm. at 23° C. contains 19,56 grm. solid matter, 0,022 grm. of which are lost through a moderate ignition. Before the ignition the residue gives with water a slightly alkaline solution.

The solid substances contained in *one liter* of this water are principally as follows :—

Chloride of Sodium	NaCl	14,717 grm.
Bromide of Sodium	NaBr	0,105 ,,
Chloride of Potassium	KCl	1,281 ,,
,, Ammonium	NH_4Cl	0,013 ,,
,, Lithium	LiCl	Traces.
,, Magnesium	$MgCl_2$	0,241 ,,
,, Calcium	$CaCl_2$	2,896 ,,
Sulphate of Lime	$CaSO_4$	0,014 ,,
Chloride of Aluminium	Al_2Cl_6	0,029 ,,
*Protosesquioxide of Manganese	$Mn_3Mn_3O_4$	0,055 ,,
‡Sesquioxide of Iron	Fe_2O_3	0,246 ,,
Silicic Acid	SiO_2	0,058 ,,
Organic Matter		Small quantity.

Liebig's analysis of the principal spring of Kreuznach, "die Oranienquelle," proves there exists much resemblance between the two waters, although the hot water spring of Arima contains still more salt and almost eight times more iron than that of Kreuznach, which contains in one liter 0,032 grm. sesquioxide of iron.

Believe me to remain,

With due respect

Your obedient Servant,

B. W. DWARS.

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* Presents itself as bicarbonate of protoxide of manganese.

‡ ,, ,, ,, ci-carbonate of protoxide of iron.

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